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Final Five-Year Review Technical Memorandum

Second Five-Year Review Report
for
Parker Landfill Superfund Site
Town of Lyndonville
Caledonia County, Vermont

September 2009

ISSUED BY:

United States Environmental Protection Agency
Region 1
Boston, Massachusetts

Approved by: Date:

for 9-30-09

James T. Owens III, Director
Office of Site Remediation and Restoration
United States Environmental Protection Agency, Region 1 – New England

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ATTACHMENTS

LIST OF ACRONYMS AND ABBREVIATIONS

ACRONYM	DEFINITION
AOC	Area(s) of Concern
ARARs	Applicable or Relevant and Appropriate Requirements
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COCs	Contaminants of Concern
DCA	Dichloroethane
DCE	Dichloroethene
DNAPL	Dense Non-Aqueous Phase Liquid
EPA	Environmental Protection Agency
ESD	Explanation of Significant Differences
ESE	Environmental Science & Engineering, Inc.
FSA	Feasibility Study Addendum
IC	Institutional Control
IGCLs	Interim Groundwater Cleanup Levels
IWS	Industrial Waste Sites
LEL	Lethal Exposure Limit
LTM	Long-Term Monitoring
LTMP	Long-Term Monitoring Plan
MCLs	Maximum Contaminant Levels
MCLGs	Maximum Contaminant Level Goals
AECOM	AECOM Environment (formerly Metcalf & Eddy)
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NAPL	Non-Aqueous Phase Liquid
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List

EXECUTIVE SUMMARY

The remedy selected to address contamination at the Parker Landfill Superfund Site, located in Lyndonville, Vermont, includes a multi-layer cap over the SWDA and IWS areas, active gas collection on the SWDA and one IWS area, a Permeable Reactive Barrier (PRB) at the source areas, bio-enhanced natural attenuation (BNA) of the downgradient aquifer, and institutional controls.

Section X of the ROD describes the original remedy for the Site, which included the following components:

- Construction of multi-layer (RCRA subtitle C) caps over the SWDA and three IWS areas;
- Installation and operation of a gas collection system in the SWDA and IWS-1 area to reduce landfill gas accumulation and lateral migration below the solid waste landfill cap;
- Installation of a source control groundwater treatment system to address overburden and bedrock, the configuration of which was to be determined during pre-design studies of site groundwater;
- Conducting long-term sampling and analysis of groundwater and sediment to assess compliance with the groundwater cleanup levels through natural attenuation and to ensure sediments in nearby brooks/river have not been adversely impacted;
- Institutional controls to protect the cap, and to restrict groundwater use, including the extension of municipal water service to all homes potentially affected by contamination; and
- Review of the Site every five years to evaluate the effectiveness of the remedy.

An ESD was issued in July 2004 which detailed a change in the original groundwater remedy. As stated above, the original groundwater remedy specified in the ROD included a source control groundwater treatment system (extraction and ex-situ treatment) and natural attenuation of the downgradient groundwater contamination plume. The ESD specified that a PRB system would be designed and installed to treat source area groundwater and BNA would be used to treat downgradient groundwater contamination.

The capping of the landfill was initiated in April 1999, which is also the trigger date for this five-year review. The PRB and BNA system were completed in September 2005.

A new wetland area was created during 2000 as a mitigation measure to compensate for wetlands destroyed during the capping of the landfill. In 2005 and 2006, the compensatory wetland was expanded to mitigate for wetlands destroyed during installation of the PRB and BNA systems.

The remedy at the Parker Landfill Site currently protects human health and the environment because there is no current use of or exposure to site media containing contaminant concentrations exceeding applicable criteria. However, in order for the remedy to be protective in the long-term, the following actions need to be taken:

- Finalize the institutional controls.

PCE	Tetrachloroethene
PRB	Permeable Reactive Barrier
PRPs	Potentially Responsible Parties
RD	Remedial Design
RAO	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SDWA	Safe Drinking Water Act
SVOCs	Semivolatile Organic Compounds
SWDA	Solid Waste Disposal Area
TAL	Target Analyte List
TBC	To Be Considered
TCA	1,1,1-Trichloroethane
TCE	Trichloroethene
TCL	Target Compound List
VOCs	Volatile Organic Compounds
TRC	TRC Environmental Corporation
URS	URS Corporation
VPGQS	Vermont Primary Groundwater Quality Standards
VTAEC	Vermont Agency of Environmental Conservation
VTDEC	Vermont Department of Environmental Conservation

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site name: Parker Landfill Superfund Site		
EPA ID: VTD981062441		
Region: 1	**State: VT**	**City/County: Lyndonville/Caledonia**
SITE STATUS		
NPL status: X Final Deleted Other (specify)		
Remediation status (choose all that apply): Under Construction X Operating Complete		
Multiple OUs?* YES X NO	**Construction completion date:** 2001 (CAP)	
Has site been put into reuse? YES X NO		
REVIEW STATUS		
Lead agency: X EPA State Tribe Other Federal Agency ____________________		
Project Managers: Leslie McVickar		
Review period:** 4 / 30 / 2004 to 4 / 30 / 2009		
Date(s) of site inspection: 6 / 23 / 2009		
Type of review: X Post-SARA Pre-SARA NPL-Removal only; ▯ Non-NPL Remedial Action Site ▯ NPL State/Tribe-lead; ▯ Regional Discretion		
Review number: 1 (first) X 2 (second) 3 (third) Other (specify) _________		
Triggering action: Actual RA Onsite Construction at OU #_____ Actual RA Start at OU#____ Construction Completion X Previous Five-Year Review Report Other (specify)		
Triggering action date *(from WasteLAN)*: 9 / 30 / 2004		
Due date *(five years after triggering action date)*: 9 / 30 / 2009		

Five-Year Review Summary Form, cont'd.

Issues:

- In accordance with the ROD, institutional controls were to be implemented as part of the selected remedy. To date the institutional controls for the Site have not been finalized.
- The VT state standards and/or MCLs for acetone and arsenic have recently been revised and are lower than the current IGCLs.
- 1,4-Dioxane has been detected at wells nearby the Passumpsic River in the bedrock aquifer at concentrations exceeding VPGQS. Additional evaluation of the bedrock groundwater flowpaths and extent of the 1,4-dioxane exceedance plume is warranted.

Recommendations and Follow-up Actions:

- Finalize institutional controls for the Site.
- Continue gas probe monitoring to verify that lateral migration of landfill gas is minimized through balancing of the landfill gas collection system.
- Continue 1,4-dioxane analysis of groundwater samples in LTMP wells and evaluate the need for additional groundwater monitoring wells and further studies to define extent of the 1,4-dioxane plume.
- Evaluate the need to update the IGCLs for acetone and arsenic.

Protectiveness Statement:

The remedy at the Parker Landfill Site currently protects human health and the environment because there is no current use of or exposure to site media containing contaminant concentrations exceeding applicable criteria. However, in order for the remedy to be protective in the long-term, the following actions need to be taken:

- Finalize the institutional controls.

Other Comments:

None.

1.0 INTRODUCTION

The purpose of this five-year review is to determine whether the remedy for the Parker Landfill Superfund Site (the Site) is protective of human health and the environment. The methods, findings and conclusions of this review are documented within this Five-Year Review Report. In addition, this report identifies issues found during the completion of this five-year review along with recommendations to address such issues.

The United States EPA must implement five-year reviews consistent with the CERCLA and the NCP. CERCLA §121(c), as amended, states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The NCP § 300.430(f)(4)(ii) of 40 CFR states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

This is the second five-year review for the Parker Landfill site. The first five-year review was completed in September 2004. This review is required by statute as the selected remedy includes on-site capping of solid waste and a groundwater remedy which results in site contaminants remaining at the Site at concentrations exceeding those associated with unrestricted exposure to site media. The trigger for this statutory review is the start of landfill cap construction in April 1999.

The remedies implemented at the Parker Landfill site that are covered by this review include a multi-layer cap that was completed in 2001, a groundwater remediation remedy that was completed during 2005, and institutional controls.

2.0 SITE CHRONOLOGY

The chronology of all significant site events and dates is included in Table 1.

Table 1: Chronology of Site Events

Event	Date
Permitted Solid Waste Disposal at Site	October 1971 through 1992
Monitoring wells installed by landfill operator	1979
Preliminary Assessment/Uncontrolled Hazardous Waste Site Evaluation by VT AEC	1984-1985
Proposed NPL listing date	June 21, 1988
NPL listing date	February 16, 1990
Consent Order for RI/FS	August 1990
Initial Site Characterization activities by ESE, Inc.	Aug. 1990 – July 1991
Initial Site Characterization Report by ESE, Inc.	February 10, 1992
RI/FS	July 1990-June 1991
RI report complete	May 2, 1994
FS report complete	June 1, 1994
ROD Signature	April 4, 1995
Quarterly Groundwater Monitoring	1999-2007
Annual Groundwater Monitoring	2007-present
Landfill Cap	
AOC for Remedial Design	December 1996
Cap design start	1997
Cap design complete	1999
CD for Remedial Action (cap)	April 1999
Cap Construction start	April 1999
Cap Construction end	November 2000
Cap Remedy complete	December 2001
Groundwater Treatment Remedy	
Unilateral Administrative Order for Remedial Design and Remedial Action	April 26, 1999
Class IV Groundwater Reclassification Petition	May 31, 2001
Draft Institutional Control Report	December 13, 2002
VTDEC Reclassification of Groundwater to Class IV	November 6, 2003
Downgradient Pre-Design Technical Report by URS	November 7, 2003
Draft Source Area Pre-Design Technical Report by URS	January 9, 2004
Alternative Technology Analysis and Evaluation by URS	July 14, 2004
Declaration for the ESD	July 2004
EPA Approval of the Remedial Design	September 22, 2004
PRB and BNA groundwater remediation system construction begins	September 2004
PRB and BNA system construction complete	September 2005

Table 1: Chronology of Site Events	
Event	**Date**
Overall Remedy	
Preliminary Construction Completion Report signed	September 2005
First full-scale BNA groundwater remediation system injection event	November 2005
Final Inspection performed and Site is determined to be Operational and Functional	May 2006
Second full-scale BNA groundwater remediation system injection event	September 2007

3.0 BACKGROUND

Figure 1 shows the location of the Parker Landfill Superfund Site on the southern side of Lily Pond Road in the Town of Lyndonville, Caledonia County, Vermont. The current site configuration is shown on Figure 2. The Site consists of 25 acres located in an area of hilly terrain in the southeast portion of Lyndonville, approximately 0.2 miles southeast of Lily Pond. An unnamed stream traverses the site from northeast to southwest, joining a larger unnamed stream immediately southwest of the site that flows to the Passumpsic River approximately ¼-mile southwest of the site. The site is accessed via four roads: three that begin at Lily Pond Road and intersect the southwest and west sides of the site, and one entering the site from the east.

The Site is surrounded by residential areas to the north, wooded, hilly areas to the east, wooded areas and agricultural land to the south, and residential areas to the west. Pastures and cropland are located to the south of the Site, beyond Brown Farm Road. A nursing home and a private school are located approximately ½-mile southwest of the Site, on Red Village Road. Residential properties located in the vicinity of the Site include three mobile home parks located immediately northwest of the Site and assisted living homes located downgradient of the Site.

The village of Lyndonville operates a municipal water system that supplies water to the residences north and west of the site, including the nearby mobile homes. In the Fall of 1991, this municipal water supply line was extended to properties located along Red Village Road, less than ½-mile southwest of the Site. Prior to this, these properties utilized private wells.

According to site reports from the early 1990s, the private drinking water wells located within a three-mile radius of the site served a population of approximately 525. However, due to the implementation of institutional controls near the Site (discussed further in Section 4.3) and the expansion of the Village of Lyndonville's municipal water supply infrastructure, this number is expected to be much lower now. The municipal water supply wells that serve as a source of drinking water for the Village of Lyndonville are located 1.75 miles north of the Site, and provide water for a population of over 3,200. Potential human and ecological receptors to site contamination include users of private wells up to 0.5 mile downgradient from the Site, recreational users of the Passumpsic River and the unnamed tributaries flowing from the Site, and biota inhabiting the Passumpsic River and related tributaries.

3.1 Operational and Regulatory History

Historical records reviewed by ESE as part of a 1992 Initial Site Characterization indicate that prior to permitted landfilling of the site, the site area consisted of a borrow pit for the mining of sands, and was used as a Town disposal area starting in the late 1950s.

A Land Use Permit to operate a solid waste disposal facility at the site was granted by the Vermont District No. 7 Environmental Commission on July 17, 1971. Approval to operate as a sanitary landfill was granted under the authority of the Vermont Health Regulations on October 20, 1971. Operation of the landfill began in 1972, and continued through 1992. There were four distinct waste disposal areas at the Site; all were unlined. The largest waste disposal area is the solid waste disposal area (SWDA), comprising approximately 14 acres. Adjacent to the SWDA are three smaller industrial waste areas (IWS-1, IWS, 2 and IWS-3), located on the west, south, and east sides of the SWDA, respectively.

During a Preliminary Assessment completed in 1985, the Vermont Agency of Environmental Conservation (VTAEC; currently VTDEC) discovered that prior to 1983, uncontrolled disposal of industrial wastes occurred at the Site, resulting in the landfill receiving approximately 1,330,300 gallons of liquid industrial wastes and 688,900 kilograms of solid, semi-liquid and liquid industrial wastes. These wastes included waste oils, plating solutions, degreasers, paint sludges, coolant oils, sodium hydroxide, and trichloroethene or 1,1,1-trichloroethane sludge.

As a result of the findings of the VTAEC during the 1985 Preliminary Assessment and Uncontrolled Hazardous Waste Site Evaluation, the Site was referred to EPA for inclusion in the NPL under CERCLA. The EPA added the Site to the NPL as a Superfund Site on February 16, 1990. An Administrative Order by Consent for the Remedial Investigation/Feasibility Study (RI/FS) was issued by EPA to the Respondents/PRPs on August 8, 1990. The August 1990 Consent Order for the RI/FS included an order that operations at the landfill must cease on or before July 1, 1992.

3.2 History of Contamination

Between 1979 and 1984, routine groundwater monitoring conducted by the VTDEC indicated the presence of chlorinated VOCs in the groundwater and in the unnamed stream adjacent to the landfill. In 1984, VOCs were detected at concentrations exceeding federal MCLs in groundwater in five private wells approximately 0.5 miles southwest of the Site.

In 1985, VTDEC informed four PRPs of their responsibility for performing investigative work and remediation at the Site. Following EPA's placement of the Site on the NPL, between 1990 and 1994, the PRP consultant, ESE, completed and performed the RI/FS at the Site. The RI/FS report summarized the field investigations, described the nature and extent of wastes and related contaminant source areas, and described subsurface hydrogeology at the Site assessed as part of the field investigation. The SWDA was estimated to contain approximately 2 million cubic yards of waste, and based on field studies, was estimated to be about 55 feet deep on average. Based on observations during the RI/FS, the SWDA was considered a diffuse source of leachate and contaminants to soil and groundwater. RI/FS assessment results indicated that the IWS areas, due to their history of accepting industrial wastes, were serving as additional, discrete source areas from which the VOCs were leaching into site soils and groundwater.

According to the ROD, COCs for site groundwater were designated as those constituents detected during the RI at concentrations exceeding cleanup goals based on ARARs. COCs include tetrachloroethene, trichloroethene, cis-1,2-dichloroethene, 1,2-dichloropropane, 1,2-dichloroethane, benzene, vinyl chloride, and 2-butanone (all VOCs), as well as, 3-methylphenol, 4-methylphenol, chromium, nickel, manganese, and vanadium. During the RI, these contaminants were detected at the highest concentrations at the source area, and were thought to be decreasing in concentration with distance from the landfill as a result of diffusion and natural degradation processes.

Based on the results of RI groundwater studies, it was predicted that groundwater contamination could be adequately addressed by a combination of source control (i.e., capping of the waste areas), groundwater source controls (i.e., pump and treat system to address contaminants from source area), and natural attenuation. Cap construction began in 1999, approximately five years after the RI and four years after the signing of the ROD. The ROD specified that the groundwater remedy (discussed further in Section 4.0) was to be selected based on pre-design studies conducted subsequent to the RI. Post-cap groundwater monitoring confirmed the effectiveness of the cap in reducing the mass loading of contaminants to groundwater in the source area. However, monitoring data suggested there had not been a significant reduction in contaminant concentrations in the downgradient plume due to natural attenuation. Chlorinated VOCs such as trichloroethene and cis-1,2-dichloro-ethene were detected at significantly higher concentrations than previously detected in the area between the landfill and the Passumpsic River.

4.0 REMEDIAL ACTIONS

4.1 Remedy Selection

The ROD for the Parker Landfill Site was signed on April 4, 1995. The original remedies selected within the ROD to address contamination at the Parker Landfill Superfund Site consisted of (1) multi layer caps (including gas management) over the SWDA and IWS areas, and (2) source control groundwater extraction and treatment. The ROD also required the installation of additional groundwater monitoring wells, long-term monitoring of groundwater, surface water and sediment in the vicinity of the Site, and five-year site reviews.

The 1995 ROD describes the remedy required for the Site as follows:

- Construction of multi-layer (RCRA subtitle C) caps over the SWDA and IWS areas;
- Installation and operation of a gas collection system to reduce landfill gas accumulation and lateral migration below the SWDA and IWS areas that were capped;
- Installation of a source control groundwater treatment system to address overburden and bedrock contamination, of which the configuration was to be determined during a pre-design phase;
- Conducting long-term sampling and analysis of groundwater and sediment to assess compliance with the groundwater cleanup levels through natural attenuation and to ensure sediments in nearby surface waters have not been adversely impacted;
- Institutional controls to protect the cap and to restrict groundwater use, including the extension of municipal water service to all homes potentially affected by contamination; and
- Review of the Site every five years to evaluate the effectiveness of the remedy in ensuring the protection of human health and the environment.

Although the ROD specified that groundwater extraction wells would be placed in both the overburden and bedrock aquifers at the source area as part of the groundwater remedy, specific treatment technologies to treat the extracted groundwater and methods for discharge of treated water were to be determined during the design phase, in order to ensure that the most effective and least costly alternative is used. Under a 1999 unilateral order, pre-design studies and groundwater monitoring were conducted.

A revised Feasibility Study was completed under this order in June 2004, to both address current conditions at the Site and to evaluate the most contemporary technologies available to best meet the objectives identified in the ROD. In July 2004, EPA issued an ESD for the groundwater component of the ROD remedy. The adjustment in the groundwater remedy was due to changes in the extent of the downgradient groundwater plume and the emergence of more effective treatment technologies to address source area groundwater contamination. The ESD called for active treatment of the source area groundwater plume using a permeable reactive barrier wall, and active in-situ treatment of the downgradient plume using enhanced bioremediation.

Cap Remedy

The RAOs for the cap remedy (i.e., capping SWDA and IWS areas) are as follows:

- Minimize, to the extent practicable, the potential for transfer of hazardous substances from the soil and solid waste into the groundwater, surface water and sediment;
- Prevent direct contact/ingestion of soil or solid waste posing a potential total cancer risk greater than 10^{-4} to 10^{-6}, or a potential hazard index greater than one; and
- Comply with federal and state ARARs.

Groundwater Remedy

The RAOs for the groundwater remedy (i.e., source control groundwater treatment) are as follows:

- Prevent ingestion of groundwater containing COCs in excess of federal or state standards, or posing a potential total cancer risk greater than 10^{-4} to 10^{-6}, or a potential hazard index greater than one; and
- Comply with federal and state ARARs.

Although EPA issued an ESD for the groundwater component of the ROD remedy in July 2004, the RAOs for the groundwater remedy remained unchanged.

4.2 Landfill Cap Remedy Implementation

Construction of the cap began in April 1999 and was completed in December 2001. The design components of the cap were set forth in the Landfill Cap Remedial Design Statement of Work dated November 1996. Industrial wastes and contaminated soils were excavated from IWS-2 in June 1999 and placed into the SWDA area prior to capping, eliminating the need for a separate cap over IWS-2. A continuous multi-layer cap was constructed over SWDA and IWS-1 between May 1999 and October 2000. A separate multi-layer cap was constructed over IWS-3. The landfill gas management system was constructed to control gas generated in the SWDA and IWS-1 areas (no gas recovery in IWS-3). The active gas management system consists of 17 gas extraction wells, piping and blowers, and an enclosed flare to destroy VOCs and methane. A compensatory wetland was constructed to mitigate wetlands lost during construction of the cap. Institutional controls associated with the landfill cap remedy have been defined and have been implemented. Details of the cap conditions are presented in Section 6.2 of this report.

4.3 Groundwater Remedy Implementation

4.3.1 Source Area Groundwater – Permeable Reactive Barrier

The PRB technology uses a reactive media of granular zero-valent iron to treat chlorinated VOCs in groundwater by permanently reducing the volume and toxicity of the contaminants through reductive de-halogenation, as electrons transfer from the iron to halogenated VOCs at the iron surface contact point. The result is halogen ions being replaced by hydrogen species that yield the non-halogenated compounds ethene or ethane. These, in turn, are mineralized by bio-degradation in the groundwater downgradient of the PRB treatment cell.

The "Draft Source Area Pre-Design Technical Report" dated January 9, 2004, evaluated the feasibility of a zero-valent iron PRB wall to passively intercept the upgradient portion of the VOC-contaminated plume, and to effectively reduce concentrations of chlorinated VOCs in groundwater at the source area. This report concluded, based on column testing and bench-scale studies, that a zero-valent iron PRB would be effective in reducing concentrations of chlorinated VOCs to below the groundwater cleanup goals at the Site.

The PRB was installed using an open trench technique with excavation by an extended-arm backhoe, using a bio-polymer slurry for support (guar gum). The trench is approximately 2.5 feet in width and approximately 235 feet in length. The trench depth is approximately 62 feet deep, decreasing linearly to an approximate 30-foot depth at the eastern end. The trench was backfilled with a granular iron/sand blend.

The PRB is comprised of four sections containing different iron/sand blends. Iron percentages by weight of 34.5 percent, 61.2 percent, 100 percent, and 51.3 percent correspond to different VOC contaminant zones. This material was placed in the trench continuously using a tremie pipe to an elevation of two feet above the high groundwater table, and was backfilled with sand. In order to adequately monitor the performance of the PRB and to reduce contaminant concentrations in the groundwater, additional monitoring well clusters were installed.

A total of eight monitoring wells, in three well clusters were installed within the trench during construction. Each cluster was bound together with nylon ties surrounding a section of reinforced steel bar and suspended in the excavation as the trench was backfilled with the iron/sand blend. These wells are 1-inch diameter and constructed using a 10-foot polyvinyl chloride (PVC) screen and riser. In addition, 21 monitoring wells in eight clusters were installed at strategic locations around the PRB perimeter. All wells were tested during construction to assess groundwater quality and geochemistry. The initial testing indicates that VOC concentrations have reduced and that there is an elevated concentration of ethene/ethane. As designed, a reactive zone has been established and de-chlorination is occurring. O&M is currently being performed by the PRPs.

The physical extent of the PRB cell constructed to intercept contaminated groundwater is noted above. The cell was constructed adjacent to the south-eastern edge of the landfill. In order to construct the PRB, the following activities occurred: 1) relocation of a power line; 2) up-grade of an access road; 3) abandonment of select groundwater monitoring wells; 4) extension of an existing stream culvert; 5) re-grading of the area where the PRB was located (including erosion and sediment control measures and seeding); and 6) construction of a gravel work pad and guide wall.

4.3.2 Downgradient Groundwater – Bio-enhanced Natural Attenuation

Construction of the bio-enhanced natural attenuation technology included limited modification of the terrain in the downgradient area to improve access to install a series of injection/extraction wells. Area preparation included limited clearing of trees and brush, construction of an access road, and the extension of an electrical power line from Lily Pond Road. The wells installed span a distance of approximately 500 feet and are located approximately 40 feet apart. To meet the cleanup objectives, groundwater is periodically withdrawn from the extraction wells and amended using a sodium lactate/nutrient solution and re-injected back into the overburden groundwater via injection wells. Based on the pre-design test results this solution contains: 60% sodium lactate; ammonium bromide; ammonium carbonate; and ammonium phosphate. As with the PRB technology, a post implementation monitoring program is ongoing to track the induced effects within the groundwater system. This includes quantifying geochemical field parameters that contribute to, or are indicators of, the degradation of the chlorinated organic contaminants.

4.3.3 Compensatory Wetland

The PRB work pad construction required removing approximately 0.26 acres of wetland, as characterized in a Wetland Investigation Summary letter submitted to EPA on October 29, 2004. A compensatory wetland was constructed along the west side of the unnamed stream approximately 1,550 feet downstream from the PRB. This location is within the 50-foot-wide conservation easement located adjacent to the unnamed stream and was selected based on guidance from EPA, the U.S. Fish and Wildlife Service and the VTDEC.

A design plan for the compensatory wetland was prepared by URS and submitted for review and comment by the EPA and the VTDEC on August 17, 2005. Based on both federal and state comments, URS revised the plan and resubmitted it on August 18, 2005. EPA approved the design on August 19, 2005. The compensatory wetland is 0.44 acres in size. This ratio was approved by EPA and the VTDEC based on the designated space available within the conservation easement area. With this approval, the wetland requirements are achieved.

Wetland construction commenced on August 23, 2005. An existing log pile was relocated to an area located beyond the conservation easement area. This work was completed on August 29, 2005.

4.3.4 Institutional Controls

Institutional controls have been partially implemented. Institutional controls consist of easements and enforceable local or state regulations to restrict groundwater use. The area of restricted groundwater use was specified in the ROD to extend from the upgradient perimeter of the landfill to all downgradient boundaries of the contaminant plume (both in overburden and bedrock aquifers). The restricted groundwater use area includes a buffer zone around the contaminated area, to prevent potential spreading of the plume caused by drawdown in active private wells outside the area. In 2002, a municipal water line was constructed to service the residences within the proposed institutional control boundary. At the time of this review groundwater use easements had not been obtained for four properties within the IC boundary. The reclassification of groundwater from a Class III (all groundwater) to Class IV (not potable; suitable for some industrial and agricultural use) category was established for the 119-acre area including the landfill and downgradient plume in November 2003. A town ordinance is being currently sought to fulfill the ROD institutional controls requirements. This is anticipated to be completed in 2009.

4.4 System Operations and Maintenance

Operations and maintenance (O&M), including monitoring are conducted for both the landfill cap and groundwater remedies, as further described below.

Cap Remedy O&M

O&M for the cap remedy primarily consists of operating the flare system to burn collected methane gas and maintenance of the cap. Maintenance of the cap includes mowing, cleaning out drainage swales, repairing erosion, replanting grass seed (as needed) and removing burrowed animals from the cap.

Periodic gas probe monitoring is also conducted to monitor the migration of methane gas from areas outside of the cap.

Groundwater Remedy O&M

O&M for the groundwater remedies primarily consists of groundwater, surface water, and sediment monitoring. Groundwater monitoring wells are grouped into the Management of Migration (MOM), PRB , and BNA monitoring well groups. Annual groundwater monitoring of 25 MOM wells, 29 PRB wells, and 7 BNA wells is currently conducted. Every five years, as part of the five-year review, an additional 28 MOM wells are monitored.

Surface water sampling is conducted on an annual basis and sediment sampling is currently conducted every five years, as part of the five-year review.

5.0 FIVE-YEAR REVIEW PROCESS

This five-year review was conducted in accordance with EPA's guidance document "Comprehensive Five-Year Review Guidance", EPA 540-R-01-007, dated June 2001. Tasks completed as part of this five-year review include review of pertinent site-related documents, interviews with parties associated or familiar with the site, an inspection of the site, and a review of the current status of regulatory or other relevant standards. Site-related documents reviewed as part of this effort are listed in Attachment 2.

A fact sheet dated October 2009 was prepared by the EPA to inform the community of the five-year review.

6.0 FIVE-YEAR REVIEW FINDINGS

The information gathered during the interviews, site inspection, review of relevant standards, and site data review is described in the following subsections.

6.1 Interviews

As required in the EPA Five-Year Review Guidance Document, interviews were conducted with the VTDEC, the Town of Lyndonville, and representatives of the PRPs. Interview Record forms are provided in Attachment 3. Interviews were conducted via telephone following the site inspection.

John Schmeltzer of the VTDEC was interviewed by telephone on July 31, 2009. Mr. Schmeltzer feels that the Site is going well and the remedial actions appear to be working. He said that he has not had any complaints that have required a response from VTDEC, but he has been in contact with some of the landowners that reside within the "Institutional Controls Area" regarding land use. Mr. Schmeltzer expressed concern with the effectiveness of the BNA system in reducing concentrations and the finalization and maintenance of institutional controls.

On July 23, 2009, Bill Webb and Eric Chadburn of Fairbanks Scales, the PRP responsible for landfill O&M, were interviewed by telephone. Mr. Webb and Mr. Chadburn reported that overall the landfill portion of the Site is in good order. They stated that since the last five-year review, the controls within the flare house have been upgraded, allowing for better control of the burning of methane gas. They stated that they are planning on initiating discussions with EPA regarding the remote measurement and monitoring of methane gas at the extraction wells and possibly at the intake. They would like to do this additional monitoring to prepare for when the time comes that there is insufficient methane to burn, so that they can have a plan in place to deal with it effectively and efficiently.

Jason Clere of URS Corporation was interviewed by telephone on July 30, 2009. URS Corporation is the consultant representing Vermont American, the PRP responsible for the groundwater remedies. URS designed and is operating the groundwater remedies. Mr. Clere stated that the groundwater remedies are functioning as expected and are performing well, without any unexpected difficulties. Mr. Clere also explained that IGCLs are periodically updated as MCLs and VT standards are revised. Mr. Clere also provided information on the groundwater monitoring that has been occurring as part of O&M of the groundwater remedies.

On July 27, 2009, Justin Smith of the Town of Lyndonville Zoning Department was contacted regarding the Town's efforts to expand the "Institutional Control Area" and specifics regarding the new housing development. According to Mr. Smith, the Town is currently working on expanding the "Institutional Control Area". Mr. Smith was also asked if the houses within the new development along Brown Farm Road have basements, information useful to the vapor intrusion assessment. Mr. Smith responded that all of those houses have full basements.

6.2 Site Inspection

A site inspection was conducted on June 23, 2009, which included visual inspection of the surfaces of the SWDA and IWS-3 caps, the landfill gas management system, storm water controls, fencing, the wetland compensation areas, the PRB, and BNA injection wells. The site inspection was performed by the TRC project manager (Ms. Laurie O'Connor, P.E.) and TRC project engineer (Ms. Amy Hamilton) of TRC on behalf of EPA. Other persons attending the inspection included the project manager from the VTDEC, PRP representatives from Fairbanks Scales, Inc. and URS, a consultant for Vermont American Company, a PRP. The names of the individuals present at the inspection are recorded on a sign-in sheet attached to the Site Inspection Checklist. The current conditions of the cap and gas management system, PRB, and BNA systems were observed during the site inspection. Overall, the Site appears in good condition. The details of the site inspection are provided in an inspection report provided in Attachment 4. The findings of the site inspection are summarized below.

- The surfaces of the SWDA landfill cap and the IWS-3 cap were in good condition with no signs of erosion, holes, cracks or bulging.
- Apparent animal burrows were observed on the steep slope of the SWDA in several locations, including downslope of W-11, nearby W-15, and W-17. The animal should be removed and the hole and erosion repaired in order to prevent possible undermining of the SWDA cap.
- The slope benches and other drainage ditches were in good condition with no signs of erosion, undermining or bypass.
- The two gabion-lined downcomers, or letdown channels, on the SWDA cap were in good condition with no evident material degradation, erosion, undercutting, or obstructions, with the exception of an area of settlement in Downcomer No. 2. This settlement area has been monitored since the last five-year review inspection through surveying of five points along the settled area. Representatives from Fairbanks Scales reported that based on monitoring of settlement, no repairs have been warranted. If further settlement occurs in the future that could threaten the integrity of the cap, repairs should be conducted. In addition, slight vegetative growth was noted in Downcomer No. 2. However, the amount of vegetation is not sufficient to impede flow.
- No obstructions were observed at the ends of the drainage layer outlet pipes. The crushed stone layer along the edge of the cover system appeared to be in place and did not appear to be clogged.
- The sedimentation basin was in good condition and appeared to be functioning properly.
- The perimeter and access roads of the SWDA were in good condition. Slight erosion was observed in the access road leading from the SWDA to the IWS-3 cap. It was reported that this road is repaired on an as-needed basis. The erosion should continue to be repaired to maintain access to the IWS-3 area for maintenance.
- The landfill gas flare was operating at the time of the inspection. No obvious damage or changed condition was apparent.

- The PRB and source area monitoring wells appeared to be in good condition, based on visual observation. No wells were opened during the site visit.
- Several empty drums were stacked in a pile along the utility easement off Brown Farm Road. Most of these drums appeared to be old and unusable. URS stated that the drums had been stored there since the last BNA injection. URS has plans to remove the drums from the Site during fall 2009.
- The BNA system wells appeared to be in good condition, based on visual observation. No wells were opened during the site visit.
- The wetland compensation areas appear to be functioning as designed.

6.3 Standards Review

6.3.1 ARARs

ARARs for the Parker Landfill Site were identified in the ROD (April 1995) and include the following:

- Federal Safe Drinking Water Act MCLs and MCLGs
- Vermont Hazardous Waste Regulations
- Vermont Groundwater Protection Rule and Strategy (VT Primary Groundwater Quality Standards)
- Vermont Water Quality Standards
- Vermont Solid Waste Regulations
- Vermont Land Use and Development Law
- Vermont Air Pollution Control Regulations
- Federal NESHAP for Vinyl Chloride
- Federal NESHAP for Benzene Waste Operations
- Federal Noise Control Regulations
- Vermont Wetland Rules
- Vermont NPDES Permit
- RCRA

Additionally, the ROD identifies the following as "To Be Considered" criteria:

- Federal Safe Drinking Water Act Secondary Maximum Contaminant Levels
- Federal Safe Drinking Water Act Proposed MCLs
- Federal Drinking Water Health Advisories
- Federal Groundwater Protection Strategy
- Federal Interim Sediment Quality Criteria

Most of the ARARs cited in the ROD related to the design and construction of the landfill cap remedy have been met. Landfill cap ARARs that apply to ongoing landfill O&M activities include Vermont Air Pollution Control Regulations, Federal NESHAP for Vinyl Chloride; Federal NESHAP for Benzene Waste Operations; and ARARs related to landfill post-closure maintenance and monitoring. These ARARs will be met with continued operation and maintenance of the landfill gas management system and landfill caps.

ARARs cited in the ROD related to the groundwater remedy include the Federal Safe Drinking Water Act MCLs and MCLGs, the Vermont Groundwater Protection Rule and Strategy, and the Vermont Wetland Rules. These ARARs are being complied with or will be complied with upon remedy completion. Construction of the Permeable Reactive Barrier (PRB) component of the groundwater remedy required that wetlands be created on site to compensate for those destroyed to construct the PRB. The compensatory wetland was constructed and is inspected as part of routine O&M activities for the remedy. The remedy will be operated and groundwater quality will be monitored until groundwater cleanup goals are attained.

The Vermont NPDES Permit rules do not apply to the groundwater remedy as currently constructed, because the groundwater remedy does not include a discharge to surface water, as was envisioned in the ROD-specified groundwater remedy (a pump-and-treat system). The Vermont Underground Injection Control Rule is relevant and appropriate to the groundwater remedy as currently constructed, because bio-enhancing reagents are injected to support the Bio-enhanced Natural Attenuation (BNA) component of the remedy. This rule requires that owners of injection wells apply for a permit. However, because the remedial action is being performed on a Superfund site, it is not required that a permit be obtained. However, the substantive requirements of the UIC permit process should be met.

Interim Groundwater Cleanup Levels (IGCLs) were established in the ROD for groundwater contaminants of concern. These IGCLs were set equal to the Federal MCLs, the Vermont Primary Groundwater Quality Standards (VPGQS), or risk-derived values, whichever standards were more stringent. Table 3 presents the ROD-based IGCLs and their basis, along with the current MCL or VPGQS. Table 2 below lists those contaminants of concern for which the current MCL or VPGQS is different from the ROD-based IGCL, or those contaminants that are present in site groundwater that do not have a ROD-based IGCL but do have a MCL or VPGQS that is exceeded at some locations.

Table 2: Water Quality Standards Revised or Developed since 1995 ROD

Analyte	IGCL in ROD (ppb)	Current Standard (MCL and/or VPGQS) (ppb)	Type of Current Standard	Basis of IGCL
Tetrachloroethylene	0.7	5	MCL and VPGQS	VPGQS, 1994
2-Butanone	0.17	4.2	VPGQS	VPGQS, 1994
1,4-Dioxane	NA	3	VPGQS	NA
Arsenic	50	10	MCL and VPGQS	MCL, 1994
Acetone	3700	700	VPGQS	Risk based
Chromium	50	100	MCL and VPGQS	VPGQS, 1994
Manganese	180	300	VPGQS	Risk based

Table 3: Comparison of MCLs and VPGQS				
Carcinogenic Constituents	**ROD-Based IGCL mg/L**	**ROD Basis for IGCL**	**Current MCL/VPGQS mg/L**	**Source of Current MCL/VPGQS mg/L**
1,1-Dichloroethene	0.007	MCLG	0.007	MCL [a]
Benzene	0.005	MCL	0.005	MCL [a]
Methylene Chloride	0.005	MCL	0.005	MCL [a]
Tetrachloroethene	0.0007	VPGQS	0.005	MCL [a]
Trichloroethene	0.005	MCL	0.005	MCL [a]
Vinyl Chloride	0.002	MCL	0.002	MCL [a]
1,4-Dioxane	NA	NA	**0.003 (0.02)**	**VPGQS [b]**
Bis(2-ethylhexyl)phthalate	0.006	MCL	0.006	MCL [a]
Arsenic	***0.05***	***MCL***	***0.01***	***MCL [a]***
Beryllium	0.004	MCL	0.004	MCL [a]
Non-Carcinogenic *Constituents*	**ROD-Based IGCL mg/L**	**ROD Basis for IGCL**	**Current MCL/VPGQS mg/L**	**Source of Current MCL/VPGQS mg/L**
1,1-Dichloroethene	0.007	MCLG	0.007	MCL [a]
1,2-Dichloroethene	0.07	MCL	0.07	MCL [a, f]
Acetone	***3.7***	***RB***	***0.7***	***VPGQS [c]***
2-Butanone	0.17	VPGQS	4.2	VPGQS [c]
1,1,1-Trichloroethane	0.2	MCLG	0.2	MCL [a]
Vinyl Chloride	0.002	MCL	0.002	MCL [a]
4-Methylphenol	0.2	RB	NA	NA
Antimony	0.006	MCL	0.006	MCL [a]
Arsenic	***0.05***	***MCL***	***0.01***	***MCL [a]***
Chromium	0.05	VPGQS	0.1	VPGQS [c]
Manganese	0.18	RB	**0.3 (0.84)**	**VPGQS [e]**
Nickel	0.1	MCL	0.1	VPGQS [c]
Vanadium	0.0002	RB	NA	NA

Bold and Shaded = Vermont groundwater quality enforcement standard has been lowered since the 2004 five-year review. Previous value in parentheses after current value.
Bold and Italicized = IGCL in the ROD is higher than the Current MCL/VPGQS for this analyte.
IGCL = Interim Groundwater Cleanup Level from the ROD
MCL = Safe Drinking Water Act Maximum Contaminant Level
MCLG = Safe Drinking Water Act Maximum Contaminant Level Goal
NA = Not Applicable (no IGCL for this analyte included in ROD)
RB = Risk-Based
VPGQS = Vermont Primary Groundwater Quality Standard
[a] = National Primary Drinking Water Regulations, 40 CFR Ch. I Part 141, 7-1-02 Edition.
[b] = New interm enforcement standard for 1,4-dioxane, VT Water Supply Division, March 6, 2009.
[c] = Vermont Primary Groundwater Quality Standards, Ch. 12: Groundwater Protection Rule and Strategy, February 14, 2005.
[d] = Secondary VGQS for this compound. Per Ch. 12: Groundwater Protection Rule and Strategy, February 14, 2005: "An activity shall not cause the groundwater quality to reach or exceed the secondary enforcement standards or 110% of the secondary background groundwater quality standards established under 12-704, whichever is greater."

[e] New interim enforcement standard for manganese, VT Water Supply Division, March 6, 2009.
[f] The MCL listed for 1,2-dichloroethene is specific to the cis isomer.

The currently applicable standards for acetone and arsenic are lower (i.e., more stringent) than those applicable at the time of the ROD. The VPGQS standards for tetrachloroethylene, 2-butanone, and chromium have increased (i.e., are less stringent) from those applicable at the time of the ROD. The VPGQS for manganese has been reduced from what it was in 2004 (reduced from 840 ppb to 300 ppb), but it remains greater than the ROD IGCL of 180 ppb. Vermont has also recently revised its enforcement standard for 1,4-dioxane from 20 ppb to 3 ppb. It may be necessary to update the ROD IGCL in the future to accommodate these changes in standards, both more stringent and less stringent than those applied in the ROD, depending on review of groundwater quality data as the remedy progresses.

6.4 Data Review

A long-term monitoring program has been implemented as required by the ROD. Based on the results of the RI, contaminants associated with the Site have been found to be present in soil (mainly below the waste areas), landfill gas, sediment, surface water and in groundwater. The ROD, original LTMP (dated August 2000), and the updated LTMP (dated September 2006) specified on-going monitoring requirements for sediment, surface water, and groundwater at the Site. Figure 2 shows the locations of sediment samples, surface water samples, and groundwater monitoring wells included in the LTMP. The results of a review of available data from the past five years is presented below. These data were used to determine if any significant changes in site conditions has occurred within the past five years.

6.4.1 Sediments

As part of long-term monitoring activities required by the ROD, sampling and analysis of sediments was performed twice in the past five years at three locations (SD01, SD02, and SD03) in the unnamed stream, including once in April/October 2005 and again in September 2008. SD01 is located in the unnamed stream to the northeast (upstream) of the SWDA. SD02 is located downstream of the former IWS-2 area, and immediately upstream of the intersection of a second unnamed stream that flows from the east. SD03, considered the downstream sample, is located southwest of the Site, immediately east of Red Village Road and upstream of the Passumpsic River. Samples at each location were analyzed for VOCs and TAL metals during each sampling round.

Long-term sediment monitoring data indicate that the concentrations of VOCs and metals were generally the highest in the "upstream" samples collected from SD-01 and decreased with distance downstream and therefore, "downstream" samples are no longer collected (in accordance with the updated LTMP.

Individual round results and long-term sediment monitoring data is discussed below. Table 4 presents the comparison of maximum concentrations detected in the long-term monitoring samples collected in the unnamed stream to the project-specific sediment quality guidelines for acetone, 2-butanone, chloroethane, chloroform, trichloroethene, bis(2-ethylhexyl)phthalate, arsenic, barium, cadmium, copper, cyanide, iron, manganese, and nickel, COCs which were established for the Site in the risk assessment.

Table 4: Comparison of Unnamed Stream Sediment COC Results from 2005-2009 vs. Sediment Results from 2001-2004 and Remedial Investigation Parker Landfill Superfund Site

Parameter (COC)	*Sediment Quality Criteria*	Unnamed Stream RI Maximum Concentration	Unnamed Stream 2001-2004 Maximum Concentration	Unnamed Stream 2005-2009 Maximum Concentration
VOCs				
Acetone	*0.17*	0.24	**0.91 J**	0.31
2-Butanone	*0.91*	0.0815	**0.16**	0.0177 J
Chloroethane	*0.59*	0.01	ND	ND
Chloroform	*0.08*	0.0054	ND	ND
Trichloroethene	*5.8*	0.0054	**0.12**	0.00144 J
SVOCs				
Bis(2-ethylhexyl)phthalate	*6.2*	0.3279	NA	ND
Inorganics				
Arsenic	*33*	962.3	4.2	2.48 J
Barium	*20*	809.5	125	110
Cadmium	*5*	10.5	1.4	0.462 J
Copper	*70*	20.7	14.2	13
Cyanide	*0.1*	22.6	NA	NA
Iron	*17,000*	383,000	29,000	25,000
Manganese	*300*	2,425	**10,400**	2,390
Nickel	*30*	24.8	22.4	17.9

Concentrations in milligrams per kilogram (mg/kg).
Sediment Quality Criteria (mg/kg) are from 1993 Final Risk Assessment by TRC.
RI - 1990-1994 Remedial Investigation by ESE. (Maximum concentration is taken from results for 11 sediment samples on unnamed stream or 4 sediment samples on Passumpsic River.)
LTM - Long-Term Monitoring activities; conducted semi-annually from October 2001 to April 2004
NA - Not analyzed for given parameter.
ND - Not detected.
Black shading indicates result exceeds given sediment quality criteria.
Bold type indicates maximum concentration has increased since the previous reporting period.
J - Estimated

Sediment results by compound group are discussed below.

VOCs: Results of the April/October 2005 sediment sampling round indicate exceedances of the sediment quality criteria for acetone at SD01 and SD03. However, results of the

September 2008 sediment sampling round indicate no exceedances of sediment quality criteria for VOCs. Although there was a decrease on the number of COC exceedances and the maximum concentration of acetone is lower in the 2005-2009 data set than it was in the 2001-2004 data set, the maximum VOC results for individual COCs from 2005-2009 are generally consistent with the maximum VOC results for COCs obtained during the RI at the upgradient, unnamed stream locations, as shown on Table 4.

Inorganics: Results of the April/October 2005 sediment sampling round indicate exceedances of the sediment quality criteria for barium at SD01, SD02 and SD03, iron at SD01, and manganese at SD1 and SD03. A lesser number of exceedances of the sediment quality criteria occurred for the September 2008 sampling round, with exceedances only occurring for barium at SD03 and manganese at SD01 and SD03. There was a decrease in the maximum metals results for individual COCs from the 2001-2004 to the 2005-2009 data set, as shown on Table 4. Similarly, a decrease was seen during the last Five Year reporting period, from the maximum RI concentrations to the 2001-2004 concentrations. This data indicates an overall decreasing trend in metals concentrations in sediment.

The 1993 ecological risk assessment concluded that barium, cyanide and manganese concentrations were slightly elevated but were unlikely to result in adverse effects to resident aquatic biota. Cyanide has been removed from the long-term monitoring program because the one sample location where an elevated concentration was detected had been disturbed during the construction of the cap. Maximum barium and manganese concentrations are lower than detected during the RI.

6.4.2 Surface Water

Surface water sampling along the unnamed stream has been performed at three locations on an annual basis from April 2004 to the present. The locations of stream surface water samples (SW01, SW02, and SW03) were co-located with the sediment sample locations (SD01, SD02, and SD3), the locations of which were provided in the preceding section. Surface water sampling results are summarized below.

Individual round results and long-term surface water quality monitoring data is discussed below. Table 5 presents the comparison of maximum concentrations detected in the long term monitoring samples collected within the unnamed stream to benchmark criteria and maximum concentrations of COCs detected during the RI. The benchmark criteria are not cleanup goals but were established using available criteria and guidelines for evaluating chemical toxicity to ecological receptors. The ROD identified the COCs in surface water as aluminum, antimony, barium, calcium, chromium, iron, magnesium, manganese, nickel, potassium, silver, sodium, thallium, 1,2-dichloroethene, acetone, trichloroethene and vinyl chloride. According to the ROD, all risk values for exposure to surface water were within or below EPA's acceptable risk range.

As shown in Table 5, there was an increase in the maximum concentrations of trichloroethene, vinyl chloride, 1,2-dichloroethene, aluminum, chromium, iron, magnesium, manganese and thallium in the 2001-2004 data from the ROD levels. However, the 2005-2009 maximum

Table 5: Comparison of Unnamed Stream Surface Water COC Results from 2005-2009 vs. Surface Water Results from 2001-2004 and Remedial Investigation Parker Landfill Superfund Site

Sampling Date		Unnamed Stream		
Parameter (COC)	***Surface Water Criteria (SW03)***	**RI Maximum Concentration**	**2001-2004 Maximum Concentration**	**2005-2009 Maximum Concentration**
VOCs				
Acetone	*61*	0.015	0.01	ND
Trichloroethene	*21.9*	0.021	**0.92**	0.05
Vinyl Chloride	*17.8*	0.001	**0.0052**	0.000513 J
cis-1,2-Dichloroethene	*11.6*	0.042	**0.35**	0.0178
trans-1,2-Dichloroethene	*11.6*	0.042	0.0024	ND
TAL Metals				
Aluminum	NP	0.116	**34.1**	0.199
Antimony	NP	0.0565	0.0079	ND
Arsenic	0.15	NS	0.0127	ND
Barium	NP	0.2915	0.258	0.0317
Cadmium	0.0015	NS	0.0008	NA/ND
Calcium	NP	79.4	36.7	**59.7**
Chromium	0.0486	0.0112	**0.0523**	ND
Cobalt	0.0058	NS	0.0199	0.0134
Iron	1.0	33.75	**51.4**	0.945
Lead	0.0014	NS	0.0614	0.0134
Magnesium	NP	9.375	**11.3**	6.05
Manganese	NP	3.35	**6.99**	0.249
Mercury	0.0008	NS	0.00018	**0.000522**
Nickel	0.0337	0.0388	0.0323	ND
Potassium	NP	10.04	4.78	3.06
Selenium	0.0015	NS	0.0083	ND
Silver	0.0014	0.0144	0.0047	ND
Sodium	NP	23.55	15.1	15.1
Thallium	NP	0.0016	**0.018**	ND
Zinc	0.0758	NS	0.238	0.00977 J

NS - Not summarized in ROD.
NP - Not Published
Concentrations in milligrams per liter (mg/L).
Surface Water Quality Criteria (mg/L) for VOCs are from 1993 Final Risk Assessment by TRC.
Surface water quality criteria shown for metals are calculated value for sample location SW-03 (mg/L)
RI - 1990-1994 Remedial Investigation by ESE. (Maximum concentration is taken from results for 11 surface water samples on unnamed stream)
ND - Not detected.
Black shading indicates result exceeds given surface water quality criteria.
Bold type indicates maximum concentration has increased since the previous reporting period.

concentrations are similar to, and in most cases lower than, the maximum RI concentrations and therefore, surface water concentrations are not considered to present an adverse impact.

Results by compound group are discussed below.

VOCs: VOCs were analyzed during each round of surface water sampling. With the exception of chloromethane, VOCs were not detected above laboratory detection limits in sample SW01 from April 2004 to the present. At SW-02, 1,1,1-TCE, TCE, PCE, cis-1,2-DCE, and vinyl chloride were detected during various monitoring events. However, all VOC detections in surface water were below national recommended water quality criteria. Concentrations of VOCs remained relatively consistent with decreasing trends from April 2004 to the present.

Inorganics: Metals were analyzed during the April/October 2005 and September 2008 sampling rounds. Results of the April/October 2005 surface water sampling indicate exceedances of surface water national recommended water quality criteria for cobalt, lead and selenium at SW01. The September 2008 surface water sampling results indicate exceedances of surface water national recommended water quality criteria for mercury at SW03 and zinc at SW01. In general, there were fewer metals detected, and at decreasing concentrations, proceeding from upstream (SW01) to downstream (SW03) on the unnamed stream.

The 1993 Risk Assessment concluded that aquatic biota in the unnamed stream may be impacted by elevated concentrations of iron and silver. However, surface water concentrations of silver have decreased in the unnamed stream to non-detectable levels and the maximum 2005-2009 iron concentration is more than 30 fold lower than the maximum RI iron concentration. Therefore, the potential for ecological impacts has decreased, and the potential for human exposure has been minimized by the institutional/access controls implemented at the Site.

6.4.3 Groundwater Flow

Groundwater contour and potentiometric surface maps for shallow and top-of-rock/bedrock monitoring wells, respectively, as provided in annual Long-Term Monitoring Reports by URS, were compared to evaluate historic changes in groundwater flow. The groundwater contour and potentiometric surface contours presented in the 2004, 2005, 2006, 2007, and 2008 annual LTM Reports (based on quarterly water level measurements) show no significant changes in groundwater levels or groundwater flow direction within the study area during the post-cap period of October 2000 to the present. Therefore, groundwater flow direction has remained consistent since the last five-year review period and groundwater flow patterns appear to be stable.

6.4.4 Groundwater Quality Monitoring

Monitoring of groundwater quality at the Site has been conducted on a regular basis since 1994, prior to the construction of the cap. A LTMP was prepared for the Site in August 2000. This LTMP established a project timeline for the post-cap sampling of groundwater, surface water, and sediment samples for laboratory analysis. The long-term groundwater monitoring program was initiated in October 2000. An updated LTMP was issued by URS in 2006, which included monitoring procedures associated with the PRB and BNA systems. Results of long-term monitoring activities are subsequently documented in biannual reports (with presentation of data only) by URS, and in annual Long-Term Monitoring Reports submitted to EPA by URS. During this five-year review period (April 30, 2004 to April 30, 2009), groundwater, surface water, and sediments have been sampled on a semi-annual or annual basis through 2007 and on an annual basis thereafter for a total of five monitoring events.

While as many as 100 groundwater monitoring wells were once present in the vicinity of the Site, the original LTMP (dated 2000) reduced the number of wells subjected to periodic groundwater sampling and analysis to 40 of the wells present prior to cap construction, plus an additional eight wells that were installed during/after cap construction and subsequently added to the LTM program. The updated LTMP (dated 2006) included the sampling of new wells installed to monitor the PRB and BNA systems, specifying the sampling and analysis of 89 monitoring wells.

The groundwater monitoring well network being utilized for groundwater monitoring includes wells screened within three distinct subsurface "zones of interest". Shallow overburden monitoring wells, with screened intervals intercepting the groundwater table, have the suffix "A", "S", or "OW" after their location designation. Monitoring wells with screens completed in the overburden, but resting on the top of the bedrock interface, are termed "top-of-rock" wells, and typically end with the suffix "B", "C", or "R". The bedrock monitoring wells, with screened intervals below the bedrock, typically end with the suffix "B", "C", or "D". Laboratory analyses for samples collected in LTMP wells have included TCL VOCs, TCL SVOCs, and TAL metals. In addition, geochemistry parameters (e.g., temperature, pH, dissolved oxygen, specific conductance, and turbidity) have been measured and recorded at each LTMP groundwater sampling point.

Of the groundwater monitoring wells sampled as part of the LTM program to date, nearly all have contained contaminant concentrations exceeding applicable IGCLs for metals and/or VOCs at some point. Table 6 on the following page summarizes the maximum concentrations of the compounds that exceeded IGCLs in the latest groundwater sampling round (September 2008).

6.4.4.1 Metals Trends

The ROD identified arsenic, antimony, beryllium, chromium, manganese, nickel, and vanadium as COCs. Recent 2008 monitoring data indicate that manganese, selenium, and vanadium currently exceed their IGCLs. Arsenic also exceeds the revised IGCL. The data indicate that one or more metals exceeded its IGCL at 44 of the 66 groundwater monitoring wells sampled in

September 2008, consisting of 15 shallow overburden wells, 19 top-of-rock wells, and 10 bedrock wells. These data indicate a prevalence of elevated concentrations of vanadium and manganese (above IGCLs) versus other metals among overburden, top-of-rock, and bedrock wells.

Table 6: Maximum Concentrations of Groundwater Contaminants that Exceeded IGCLs in 2008
Parker Landfill Superfund Site

Parameter (COC)	IGCL (mg/L)	2008 Maximum Concentration (mg/L)	Location of Maximum Concentration
VOCs			
1,1-Dichloroethene	*0.007*	0.00755 J	B147B
1,2-Dichloroethane	*0.0005*	0.00405	B137B
1,2-Dichloropropane	*0.0006*	0.00651	B138B
Cis-1,2-Dichloroethene	*0.070*	4.36	B150B
1,4-Dioxane	*0.003*	0.157	B138B
2-Butanone	*0.170*	4.11	B113BB
Acetone	*0.7**	2.52	B113BB
Benzene	*0.005*	0.0392	B145C
Methylene Chloride	*0.005*	0.00833 J	B113BB
Tetrachloroethene	*0.0007*	0.156	B170B
Trichloroethene	*0.005*	8.89	B170B
Vinyl Chloride	*0.002*	1.45	B147B
SVOCs			
4-Methylphenol	*0.200*	4.62	B113BB
Inorganics			
Arsenic	*0.01***	0.0379	B137A
Manganese	*0.18*	1.17	B113A
Selenium	*0.05*	0.0817	B136C
Vanadium	*0.0002*	0.0139	B136A

*Acetone ROD IGCL was 3.7 mg/L. Current VPGQS is 0.7 mg/L.
**Arsenic ROD IGCL was 0.050 mg/L. Current MCL is 0.01 mg/L.

The recent distribution of elevated manganese concentrations in the shallow overburden, top-of-rock, and bedrock groundwater appears to be somewhat concentrated downgradient of ISW-2, while the concentrations of vanadium appear to be more widely distributed. In addition, the only elevated selenium concentration in recent groundwater monitoring data is in the bedrock groundwater at B136C.

Data collected during the first five-year review period (April 2003, October 2003, and April 2004) indicated concentrations of chromium, lead, manganese, nickel, thallium and vanadium above IGCLs in no more than ten well locations. Therefore, although there have recently been fewer metals exceeding IGCLs, exceedances have occurred at more well locations.

6.4.4.2 SVOCs Trends

During the past three annual monitoring events, only one SVOC, 3-methylphenol/4-methylphenol, was detected at a concentration above its IGCL in two wells located to the southwest of the landfill (B113BB and B138B). Historically, 3-methylphenol/4-methylphenol and/or 4-methylphenol have been detected in these wells since 2000. The COC list for SVOCs includes both 4-methylphenol and bis(2-ethylhexyl)phthalate; however, bis(2-ethylhexyl)phthalate has not been detected in any of the monitoring wells during the routine sampling events conducted since February 2000.

6.4.4.3 VOCs Trends

VOCs are the primary constituents of concern at the Site, due to their prevalence and mobility over other contaminants in groundwater. Up to eleven different VOCs have been detected at concentrations exceeding IGCLs during the last three monitoring events (October 2006, September 2007, and September 2008). These VOCs consist of benzene, 2-butanone, 1,1-dichloroethene, cis-1,2-dichloroethene, 1,2-dichloroethane, 1,2-dichloropropane, 1,4-dioxane, methylene chloride, trichloroethene, tetrachloroethene, and vinyl chloride. In general, the chlorinated VOCs cis-1,2-dichloroethene (cis-1,2-DCE), TCE, vinyl chloride, and PCE have had the highest incidence of detection in groundwater during recent monitoring events. Both of the groundwater remedies, as discussed in Section 4.3, target VOCs.

Figure 3 indicates increasing or decreasing VOC concentrations trends for groundwater monitoring wells and VOCs for which exceedances of IGCLs were detected during the September 2008 monitoring event. This figure provides a "snapshot" of concentration increases or decreases using only April 2004 and September 2008 data. Fluctuations in the data (i.e., concentration peaks) may not be discernable from Figure 3. Therefore, data trends for select wells are discussed on a long-term basis below.

Based on key indicator compound (trichloroethene and cis-1,2-dichloroethene) trend plots and other data presented in the Draft 2008 Annual Monitoring Report submitted by URS, the following historical trends were observed:

Wells Near Source Areas

- TCE and cis-1,2-dichloroethene are generally decreasing concentration within B132, B132B, and B139A, located downgradient of IWS-3. Well B103A, however, has demonstrated a recent increase in TCE concentrations (from approximately 0.2 mg/L in 2005 to 1.36 mg/L in 2008, which is higher than TCE concentrations in 2000. Based on groundwater flowpaths, it appears that groundwater in the vicinity of Well 103A will flow through the PRB.

- 1,4-Dioxane increased in well B132 (located downgradient of IWS-3) from 2004 (0.0019 J mg/L) to 2007 (0.00913 mg/L), followed by a recent decrease to 0.00433 mg/L in September 2008.

- Downgradient of the SWDA, although TCE and cis-1,2-dichloroethene have decreased within B113BB and B138B, several other VOCs are generally either increasing or stable within these wells, including 1,2-dichloropropane, 1,2-dichloroethane, and benzene which remain at concentrations above IGCLs. Well B113BB has shown significant decreases in cis-1,2-dichloroethene since 2000.

- TCE and cis-1,2-dichloroethene concentrations have decreased within B139A, located downgradient of the SWDA.

Wells Downgradient of Source Areas

- TCE and cis-1,2-dichloroethene concentrations within B125A and B136A have decreased to levels below IGCLs.

- Within B125B, TCE and cis-1,2-dichloroethene concentrations fluctuated between 2001 and 2005, but are currently at levels below IGCLs.

- Concentrations of TCE and cis-1,2-dichloroethene within B136B have fluctuated over time, but are generally exhibiting decreasing concentrations.

- B136C had a peak in TCE and cis-1,2-dichloroethene concentrations in 2005, which has since decreased to concentrations below the IGCLs.

- Benzene has recently increased in concentration at B136C, with levels between 20 and 20 ug/L in the past 3 years (2006, 2007, and 2008).

Wells Near Downgradient Property Lines

- TCE and cis-1,2-dichloroethene concentrations are decreasing at B120C. However, concentrations of TCE remain at a concentration significantly higher (1.6 mg/L) than the IGCL.

- B120D exhibited a peak in TCE concentrations in 2005 followed by a peak in cis-1,2-dichloroethene concentrations in 2006, which are now followed by decreasing or stable trends.

- B126A exhibited a peak in both TCE and cis-1,2-dichloroethene concentrations in 2005 with TCE concentrations up to 5 mg/L, which have been followed by decreasing trends since 2005.

- Concentrations of TCE and cis-1,2-dichloroethene were relatively stable in B126B until an increase (up to approximately 1 mg/L for TCE) occurred in 2006. Since 2006, TCE and cis-1,2-dichloroethene concentrations have decreased, but remain elevated, with concentrations of 0.308 mg/L and 0.187 mg/L for TCE and cis-1,2-dichloroethene, respectively.

- 1,4-Dioxane has fluctuated in concentration over time, but has generally increased in concentration within B126B, with a concentration of 0.0057 mg/L in 2004 to 0.0158 mg/L in 2008. In 2006, 0.0628 mg/L of 1,4-dioxane was detected at B126B.

BNA Monitoring Wells

- BNA monitoring wells have generally exhibited a decrease in TCE concentrations with an initial increase in cis-1,2-dichloroethene concentrations, followed by a decrease in cis-1,2-dichloroethene, and an increase in vinyl chloride concentrations. Wells B147B, B149B, and B150B exhibit this trend. This trend is not as apparent in B172B, although the concentration of TCE within this well has decreased since 2006. The TCE concentration within B173B appears to be either stable or increasing slightly since 2006.

PRB Monitoring Wells

- Concentrations of VOCs downgradient of the PRB are lower than VOC concentrations in corresponding upgradient wells, indicating that the PRB continues to be effective in reducing VOC contamination in groundwater immediately downgradient of the in-situ wall.

6.4.4.3.1 Extent of VOCs in Groundwater

Delineating the extent of the VOC plume in groundwater is important for evaluating the effectiveness of the remedies and implementation of institutional controls. The VOC contaminant plume is defined as where VOCs exceed IGCLs in groundwater.

Figure 4 presents the September 2008 IGCL exceedances by flow zone. All wells shown on the figure were sampled during 2008, and only wells that had one or more compounds exceed its IGCL have results shown. In September 2008, concentrations of 1,4-dioxane exceeding the IGCL of 3 ppb were detected in shallow overburden well B144A (31.4 ppb) and top-of-rock wells B144B (3.01 ppb), located near the utility easement off Brown Farm Road. Along Lily Pond Road, top-of-rock well B119C contained concentrations of 1,4-dioxane (5.95 ppb) and 1,2-dichloroethane (0.525 ppb) and shallow overburden well B119B contained a concentration of 1,2-dichloroethane (0.699 ppb) exceeding IGCLs. These IGCL exceedances are located outside of the current Institutional Control Area.

In November 2003, groundwater at the Site was reclassified from Class III to Class IV, and a Groundwater Reclassification Area was delineated based on the area of IGCL exceedances defined from October 2000 data. The Groundwater Reclassification Memo with a map of showing the groundwater reclassification area, is included in Attachment 5. Within the last five-year review report, exceedances were noted for 1,2-dichloropropane in the B145B/C monitoring wells, which appear to extend into the 200-foot buffer zone of the Groundwater Reclassification Area. Since this time, exceedances of 1,2-dichloropropane, as well as several more compounds, including benzene, 1,2-dichloroethane, vinyl chloride, and vanadium have occurred in the B145B and/or B145C monitoring wells.

This information indicates that the limits of the current Institutional Controls that have been established on a portion of the Site do not encompass the area of recent IGCL exceedances. However, the Town of Lyndonville plans to expand the Institutional Control Area to mirror the Groundwater Reclassification Area.

In addition, VOCs, including 1,1-dichloroethane, 1,2-dichloroethane, acetone, chloromethane, and/or trichloroethene, have been detected in shallow groundwater near occupied residences, including B118A, B119B, B120A, B121OW, B126S, B131B, B136A, B137B, B144A, B174A, B201OW, and MW-4A. Although a risk screening concluded that the vapor intrusion pathway was not significant at this time, as further described in Section 7.2.1, the groundwater trends analysis indicates that concentrations of several VOCs are increasing. Therefore, groundwater monitoring should continue in the vicinity of occupied buildings to ensure that concentrations do not increase to levels exceeding the vapor intrusion screening criteria. Note that this pathway may require further consideration in the future as methods used to evaluate this complex pathway evolve.

6.4.4.3.2 1,4-Dioxane

Groundwater samples have been collected from the management of migration (MOM) monitoring wells for 1,4-dioxane analysis since the last five-year review reporting period. During the September 2008 monitoring event, groundwater samples from 56 monitoring wells were analyzed for 1,4-dioxane, a solvent additive typically associated with 1,1,1-TCA. The mobility of 1,4-dioxane in the environment is greater than most chlorinated VOCs, including 1,1,1-TCA, and therefore, the 1,4-dioxane plume is larger than the plume of other VOCs.

As shown on Figure 4, there are multiple 1,4-dioxane exceedances within the shallow overburden, top of rock, and bedrock wells downgradient of the Site, near Lily Pond and Red Village Roads. In general, higher 1,4-dioxane concentrations are present in the bedrock wells (e.g., B120D at 20.6 ppb and B126B at 15.8 ppb). Therefore, there is the potential that the 1,4-dioxane plume extends beyond the boundary of the proposed Groundwater Reclassification Area. The highest concentrations of 1,4-dioxane were detected in wells B138B and B113BB, located immediately southwest and south of the SWDA, respectively, and the next highest concentration was detected in the top of rock monitoring well B131C (at a concentration of greater than 50 ppb), located approximately half-way between the SWDA and the Passumpsic River. Continued monitoring of groundwater for 1,4-dioxane is necessary, and may require the monitoring of additional existing monitoring wells and/or the installation and monitoring of new groundwater wells.

6.4.5 Landfill Gas

The concentration of landfill gas is monitored at gas extraction wells within the SWDA landfill and off-cap gas monitoring probes. The crawl spaces beneath the mobile homes to the north west of the landfill have also been monitored in the past for the presence of landfill gas. The gas extraction wells are monitored weekly for flow rate, temperature, vacuum, and the concentrations of methane, carbon dioxide and oxygen. The data are used to balance the landfill gas management system by optimizing methane gas collection and minimizing the rate at which oxygen is pulled into the waste from the atmosphere. Excess oxygen can result in spontaneous combustion of the waste and subsurface fires. Monitoring data indicate the landfill gas management system is properly balanced.

Subsurface gas monitoring probes have been installed mainly in the northwest portion of the Site to define the extent of landfill gas beyond the boundary of the SWDA landfill. The 51 gas monitoring locations are broken into three classifications that require different monitoring frequencies. In addition, two or more wells are installed at some of the monitoring locations in order to define the vertical distribution of landfill gas. The subsurface investigations conducted during the installation of the probes indicate there are two separate zones beneath the mobile home park, shallow and deep, where landfill gas has been shown to migrate. The zones are separated by a fine-grained silt layer that appears to act as a leaky confining layer that retards the vertical migration of landfill gas from the deep zone into the shallow zone.

Probe monitoring data indicate that historically higher and more sustained concentrations of methane have been detected in the deep zone while the detections in the shallow zone have been generally lower and intermittent. During the last five-year review (2004), it was noted that there was a strong correlation between periods of low barometric pressure and the presence of landfill gas in both zones and that the low barometric pressure was creating a pressure differential between the landfill waste and the surrounding soils causing gas to migrate from the high pressure (landfill waste) to low pressure (surrounding soils). The rise and fall of the barometric pressure was resulting in a pulsing of landfill gas into the soils below the mobile homes. It was not clear whether the gas in the shallow zone was the result of vertical migration from the deep zone or lateral migration directly from the landfill. In either case, gas in the shallow zone has the most potential to migrate upward into the crawl spaces beneath the mobile homes, or the interior of the mobile homes where the gas would be cause for concern.

The PRP is currently conducting monitoring of core probes on a monthly basis. Two levels of contingency are currently in place to protect the safety of the mobile home residents. A concentration above 20% of the LEL within a shallow probe triggers expanded monitoring to define the extent of the gas plume until concentrations subside. A concentration of 50% of the LEL within a shallow probe triggers expanded monitoring of the mobile homes to determine if explosive concentrations are present.

Figure 5 shows locations of the gas monitoring probes. In general, the methane concentrations in landfill gas probes declined since balancing and optimization of the landfill gas management system started in January 2003. From October 2002 through January 2005, gas probes were monitored on a daily basis. Beginning in February 2005, following approval of the Gas Probe Monitoring Program and Contingency Plan in January 2005, barometric-based monitoring was conducted, which included monitoring on a monthly basis at a minimum, but more frequently if the barometric pressure fell below the benchmarks.

During the last five-year review period (2001 to 2004), data was presented for gas probes GP-21B (shallow) and GP-21A (deep), showing a significant decrease over that period from the highest methane concentrations (as percent LEL) of 250 and 74 for the deep and shallow zones, respectively. In response to the 2004 five-year review report recommendations for further monitoring and delineation of the elevated methane concentrations, additional probes were installed in October 2004 and August 2006, including GP-34A and B and GP-35 located downgradient of the GP-21 cluster.

Figure 6 shows the results of the monitoring for GP-34B (shallow) and GP-34A (deep) from November 2006 to April 2009. This graph shows that methane has not been detected in the shallow probe (GP-34B) and methane concentrations have decreased in GP-34A (the deep probe). Over this timeframe, methane was not detected in either of the GP-21 probes or at GP-35. It is likely that the lack of and declining methane concentrations is due to the methane gas collection system being properly balanced.

To date methane has not been detected in the crawl spaces below the mobile homes, even when the concentration of methane in the shallow gas probes exceeded 50% LE (during the last five-year review period). Therefore, the performance standard for the landfill to maintain gas concentrations to 25% of the LEL in the shallow soil below the mobile homes and 100% LEL at the landfill boundary is protective. The 25% LEL standard represents a factor of safety of 4 against explosion in subsurface structures. The factor of safety should be higher for the crawl spaces due to the dispersion of the gas when it enters the atmosphere. Continued monitoring is critical to ensuring the remedy is protective in the future.

7.0 TECHNICAL ASSESSMENT

This section discusses the technical assessment of the remedy and provides answers to the three questions posed in the EPA Guidance (USEPA, 2001).

7.1 Question A: Is the remedy functioning as intended by the decision documents?

Yes. The review of documents, ARARs, and the results of the site inspection indicate that the landfill cap remedy is functioning as intended by the ROD. The capping of the SWDA and IWS-3 has achieved the remedial objectives of minimizing, to the extent practicable, the potential for transfer of hazardous substances from the soil and solid waste into the groundwater, surface water and sediment; and to prevent direct contact/ingestion of soil or solid waste posing a potential total cancer risk greater than 10^{-4} to 10^{-6}, or a potential hazard index greater than one. Construction of the groundwater remedy was completed in September 2005, and the groundwater has been reclassified to Class IV (not potable; suitable for some industrial and agricultural use). A municipal water line was constructed to service the residences within the proposed institutional control boundary, preventing current exposures through household water use. However, due to the fact that institutional controls have yet to be finalized for the property, the remedy, as prescribed in the ROD has not yet been fully implemented. This does not impact the remedy's protectiveness at this time since no one is currently using the site or associated contaminated water. Should the institutional controls not be finalized, this could impact the remedy's protectiveness in the future.

The landfill gas management system was designed and constructed in accordance with the Landfill Cap RD Statement of Work dated November 1996 and standard engineering practice. While the performance standard for the gas management system is to protect the potentially exposed individuals and comply with federal and state regulation, there has been some concern in the past with the ability of the landfill gas system to achieve the ROD objective of preventing lateral migration of landfill gas. The point of compliance for air, consistent with the NCP, shall be the point(s) of the maximum exposed individual, considering reasonable expected used of the Site and surrounding area. The maximum exposed individuals include: (1) adjacent residents; (2) operation and maintenance personnel; and (3) individuals working at the facility. The gas collection system is successful in preventing an unacceptable risk of exposure to the maximum exposed individuals by controlling the release of landfill gas and treating collected landfill gas. The gas collection and treatment system also complies with federal and state air regulations. To date methane has not been detected in the crawl spaces below the mobile homes and monitoring data indicate that the frequency of detection and concentration of methane in the subsurface has declined over time to the point where it is currently non-detect in most gas probes. Current monitoring of the shallow gas probes provides sufficient warning to allow evacuation of the mobile home residents prior to the development of explosive conditions.

Operation and maintenance of the caps and landfill gas management system has been effective. Minor issues as identified in the site inspection continue to be addressed adequately. The landfill gas management system is the only component of the cap remedy that offers the possibility of optimization. The landfill gas management system is continually optimized during monthly site visits and currently appears to be well balanced and controlling lateral migration of landfill gas.

7.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?

No. Question B is addressed by reviewing the human health and ecological risk assessments that formed the basis for the selected remedies, describing any significant differences as compared to current risk assessment practice, and qualitatively evaluating the impact of any such differences on remedy protectiveness.

7.2.1 Human Health Risk Review

The 1993 risk assessment evaluated the risks and hazards associated with current and future ingestion of groundwater in the entire vicinity of the site and on the site, direct contact with and incidental ingestion of soil and sediment at the site, and inhalation of VOCs in air emitted from the landfill and the unnamed stream. The primary risks and hazards observed in this analysis were those associated with the ingestion of contaminated groundwater by an adult. The primary risk contributors for the groundwater ingestion pathway were 1,2-dichloroethene, trichloroethene, vinyl chloride, 4-methylphenol, arsenic, and manganese. The risks and hazards associated with incidental ingestion of and dermal contact with soil were less significant than those estimated for groundwater ingestion. However, elevated risks and hazards for soil exposures in the IWS-2 and IWS-3 areas were attributable to trichloroethene, barium, chromium, and vanadium for a future residential scenario. Risks and hazards above EPA's risk management guidelines were also estimated for future recreational sediment exposure in the unnamed stream, due to arsenic. Potential risks associated with current trespasser exposure to surface soil, surface water, and sediment and exposure to VOCs in ambient air were below EPA's risk management guidelines. The risk assessment did not evaluate the potential for vapor intrusion from groundwater contaminants into structures overlying the groundwater, current or future exposures to surface water, or direct contact with soil or shallow groundwater by excavation workers.

There were no cleanup levels established for the landfill cap remedy as the landfill cap prevents exposures to contaminated soil and solid wastes. The ROD established interim groundwater cleanup levels as MCLs, MCLGs, or VPGQS, as available. For chemicals lacking regulatory limits, risk-based values were used as interim groundwater cleanup levels. Sediment and surface water are monitored periodically to determine landfill impacts to the unnamed brook.

In this five-year review report, the toxicity values that served as the basis for the cleanup levels, as contained in the ROD, have been re-evaluated to determine whether any changes in toxicity impact the protectiveness of the remedy. Any changes in current or potential future exposure pathways or exposure assumptions that may impact remedy protectiveness are also noted. In addition, environmental data, available since the last five-year review, have been qualitatively evaluated to determine whether exposure levels existing at the site present a risk to current human receptors.

Changes in Toxicity Criteria

Tables 1 and 2 in Attachment 6 present the changes in toxicity values (oral reference doses and oral cancer slope factors) for compounds selected as compounds of potential concern selected in the 1993 risk assessment. Updated toxicity information was obtained from the Integrated Risk Information System (IRIS; USEPA, 2009b) and other current EPA sources (e.g., the Superfund Technical Support Center).

For most contaminants, changes to toxicity information have been minimal and primarily reflect decreases in toxicity (e.g., 1,2-dichloropropane, 1,1-dichloroethene, 1,1,1-trichloroethane, and barium), though some compounds are now believed to have greater toxicity than thought is 1993 (e.g., tetrachloroethene and benzene). Changes in toxicity values for most groundwater COCs (e.g., 1,1-dichloroethene, 1,1,1-trichlorethane, benzene, and tetrachloroethene) would not affect remedy protectiveness since cleanup levels for groundwater are based on federal or state standards. Once interim groundwater cleanup levels are achieved, an evaluation should be performed to demonstrate that the risk and hazard associated with potable groundwater do not exceed EPA's risk management guidelines. Until groundwater cleanup levels are achieved and groundwater use is demonstrated to pose no risk to human health, the installation of private wells and associated groundwater exposure pathways should be prevented.

Vinyl chloride is the only groundwater contaminant of concern (COC) which has been determined to be carcinogenic through a mutagenic mode of action. In the 2005 Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, EPA recommends evaluating chemicals with mutagenic modes of action using either chemical-specific data on susceptibility from early-life exposures or age-dependent adjustment factor (ADAF) applied to the cancer slope factor. Because chemical-specific data on susceptibility from early-life exposures were available for the derivation of vinyl chloride's updated cancer slope factor, the updated slope factor is used for risk characterization and an ADAF is not applied. None of the other groundwater COCs has been determined to be carcinogenic by a mutagenic mode of action. However, should further research show that site COCs are carcinogenic by a mutagenic mode of action, the toxicity values should be further evaluated to determine the potential risk associated with early-life exposures to these contaminants.

One compound not identified as a groundwater COPC in the 1993 risk assessment is 1,4-dioxane, a common solvent stabilizer used with 1, 1, 1- trichloroethane-based degreasers. Recent (2008) groundwater sampling for 1,4-dioxane resulted in detected concentrations up to 157 ug/L. Monitoring of 1,4-dioxane should be continued and the risk evaluation to be performed after achieving interim groundwater cleanup levels should include 1,4-dioxane as a potential risk contributor.

Changes in toxicity do not affect the soil remedy since the SWDA and IWS areas have been consolidated and capped. The risk assessment identified a future risk associated with residential use of these areas. Therefore, as long as the cap remains intact and the property is not used for residential purposes in the future, the remedy remains protective for soil exposure pathways. Institutional controls should be implemented to assure future protectiveness for soil exposures.

Changes in Exposure Pathways, Assumptions and Methods

There have been no changes in land use since the last five-year review, except for the construction of a residential development along Brown Farm Road, to the south of the Site. The landfill property is undeveloped and fenced, with only the occasional trespasser accessing the property. With respect to groundwater use, exposures to contaminants in groundwater used as household water or for other purposes are controlled. Municipal water has been supplied to residences within the groundwater plume. However, additional enforceable controls may be needed to assure future protectiveness until interim groundwater cleanup levels are achieved.

The 1993 risk assessment did not specifically assess the risk to excavation workers exposed to soil or shallow groundwater contamination during intrusive activities. Because this receptor population has not been evaluated, excavations into areas of the site with soil and shallow groundwater contamination should be prevented, or an evaluation should be performed to determine the potential risk to workers prior to initiating intrusive activities as part of site re-development.

An additional pathway of potential concern that was not evaluated in the 1993 risk assessment was the vapor intrusion pathway. This pathway may be of concern at sites where shallow groundwater contaminated with VOCs exists in close proximity to occupied buildings. The vapor intrusion pathway from groundwater to indoor was evaluated in 2003 and was determined to be associated with negligible risk due to the presence of clean groundwater between the deep groundwater plume and the vadose zone. Because there are occupied residences located within the mapped area of groundwater contamination, this pathway was re-evaluated by comparing shallow groundwater VOC concentrations from the vicinity of the occupied residences to groundwater screening concentrations protective of groundwater to indoor air impacts. This comparison is provided in Table 7. The screening concentrations were obtained from EPA's vapor intrusion guidance (Table 2c; USEPA, 2002). For screening concentrations on Table 2c that were truncated at the MCL, the screening concentrations presented correspond to a cancer risk of 1×10^{-6} for carcinogens or a hazard quotient of 1 for non-carcinogens.

Shallow overburden wells included in the analysis are: B118A, B119B, B120A, B121OW, B126S, B131B, B136A, B137B, B144A, B174A, B201OW, and MW-4A. VOC concentrations are significantly below screening criteria. Therefore, the vapor intrusion pathway would not be associated with a cumulative cancer risk and non-cancer hazard greater than EPA's risk management criteria, confirming the conclusions of the 2003 evaluation that the remedy is currently protective of vapor intrusion. However, the groundwater trends analysis (Figure 3) indicates that concentrations of several VOCs are increasing, indicating that groundwater monitoring should continue in the vicinity of occupied buildings to ensure that concentrations do not increase to levels exceeding the vapor intrusion screening criteria. Note that this pathway may require further consideration in the future as methods used to evaluate this complex pathway evolve. In addition, should further site development include the construction of occupied buildings above areas where shallow groundwater VOC contamination is present, the indoor air pathway should be further evaluated to determine the potential risk to individuals using those buildings. It should be noted that 1,4-dioxane was detected in a number of the shallow overburden wells. However, because 1,4-dioxane does not readily volatilize from groundwater and does not meet EPA's definition of a volatile compound, it is unlikely to contribute significantly to vapor intrusion risk.

Table 7: Comparison of Shallow Overburden Groundwater Concentrations to Vapor Intrusion Screening Criteria		
VOC	**2008 Shallow Overburden Groundwater Concentration (ug/L)**	**Vapor Intrusion Screening Criterion (ug/L) [a]**
1,1-Dichloroethane	0.723	2,200
1,2-Dichloroethane	0.699	2.3
Acetone	3.92	220,000
Chloromethane	0.408	6.7
Trichloroethene	0.259	2.89

(a) Values taken from Table 2c of USEPA 2002. For screening concentrations truncated at the MCL on Table 2c, the screening concentrations corresponding to a cancer risk of 10^{-6} and non-cancer hazard of 1.

A new method to evaluate compounds with mutagenic modes of action such as vinyl chloride is now recommended by EPA. The currently recommended method was not used as part of the 1993 evaluation since the EPA carcinogen risk assessment guidance was published subsequent to the completion of the site-specific risk assessment. However, because a risk assessment will be conducted to confirm that the groundwater is safe to use for potable purposes once cleanup levels have been achieved and soil exposures are prevented by the landfill cap remedy, this change in methodology does not affect the protectiveness of the remedy.

Human Health Risk Evaluation of Recent Sampling Data

Sediment: As part of long-term monitoring activities required by the ROD, sampling and analysis of sediments was performed twice in the past 5 years at three locations (SD01, SD02, and SD03) in the unnamed stream, including once in April/October 2005 and again in September 2008. Table 8 summarizes the maximum detected concentrations observed in sediment over the last 5 years at the three locations.

To conservatively evaluate whether the maximum detected sediment concentrations would pose a risk to trespassers or recreational users, a comparison to residential soil screening levels (USEPA, 2009a) has been performed. The residential soil screening levels are developed based on current toxicity information and correspond to a carcinogenic risk of 1×10^{-6} and a non-carcinogenic hazard of 1. Because the screening levels are based on exposures assumed to occur in a residential yard at a frequency, duration, and intensity greater than sediment exposures within the unnamed brook, this comparison is highly conservative.

Table 8: Comparison of 2005-2009 Maximum Sediment Concentrations to Risk-Based Screening Levels		
Pollutant	**2005-2009 Maximum Sediment Concentration (mg/kg)**	**Risk-Based Screening Level (mg/kg)**
Acetone	0.31	61,000
2-Butanone	0.0177	28,000
Trichloroethene	0.00144	2.8
Arsenic	2.48	0.39
Barium	110	15,000
Cadmium	0.462	71
Copper	13	3,100
Manganese	2,390	1,800
Nickel	17.9	1,500

Maximum detected sediment concentrations are below the risk-based screening level except for the arsenic and manganese. However, the sediment arsenic concentration exceeds the screening level set at a cancer risk of 1×10^{-6} by less than 10-fold, and the manganese sediment concentration only slightly exceeds the screening level set at a hazard quotient of 1. Therefore, this comparison of maximum sediment concentrations to highly conservative residential soil screening levels indicates that exposure to sediment in the unnamed brook would not be associated with a cumulative cancer risk and non-cancer hazard greater than EPA's risk management criteria and consequently, would not pose a risk to human health.

Surface Water: Surface water sampling along the unnamed stream was also performed at three locations on an annual basis from April 2004 to the present. The locations of stream surface water samples (SW01, SW02, and SW03) were co-located with the sediment sample locations (SD01, SD02, and SD3). Table 9 summarizes the maximum detected concentrations observed in surface water over the last 5 years at the three locations.

To conservatively evaluate whether the maximum detected surface water concentrations would pose a risk to trespassers or recreational users, a comparison to tap water screening levels (USEPA, 2009a) has been performed. The tap water screening levels are developed based on current toxicity information and correspond to a carcinogenic risk of 1×10^{-6} and a non-carcinogenic hazard of 1. Because the screening levels are based on exposures assumed to occur to household water at a frequency, duration and intensity greater than surface water exposures within the unnamed brook, this comparison is highly conservative. Due to the depth of surface water within the unnamed brook, ingestion exposures are anticipated to be minimal (i.e., less to 50 mL assumed for swimming exposures) compared to an assumed daily tap water ingestion rate of 2000 mL (i.e., a difference of 40-fold).

Table 9: Comparison of 2005-2009 Maximum Surface Water Concentrations to Risk-Based Screening Levels		
Pollutant	**2005-2009 Maximum Surface Water Concentration (ug/L)**	**Risk-Based Screening Level (ug/L)**
Trichloroethene	50	1.7
Vinyl chloride	0.513	0.016
cis-1,2-Dichloroethene	17.8	370
Aluminum	199	37,000
Barium	31.7	7,300
Cobalt	13.4	11
Lead	13.4	15
Manganese	249	880
Mercury	0.522	11
Zinc	9.77	11,000

Maximum detected surface water concentrations are below the risk-based screening level except for the trichloroethene, vinyl chloride, and cobalt. However, because the exceedances are less than 40-fold (a conservative tap water to surface water adjustment factor), the exposure to surface water in the unnamed brook would not be associated with a cumulative cancer risk and non-cancer hazard greater than EPA's risk management criteria and consequently, would not pose a risk to human health.

As discussed in Section 6.4.4, a number of VOCs, 4-methylphenol, arsenic, manganese, selenium, and vanadium have been detected in groundwater in excess of their respective cleanup levels. Continued exceedances of cleanup levels indicate that completion of the drinking water ingestion pathway would pose a risk to current and future residents. However, as previously discussed, a municipal water line was constructed to service the residences within the proposed institutional control boundary and groundwater impacted by the Site has been reclassified from Class III (all groundwater) to Class IV (not potable; suitable for some industrial and agricultural use). To assure future protectiveness until groundwater concentrations meet interim cleanup levels, a town ordinance is being sought to fulfill the ROD institutional controls requirements.

Changes in Standards and To Be Considered

Interim cleanup levels have been established in groundwater for all contaminants of concern identified in the human health risk assessment found to pose an unacceptable risk to either public health or the environment. The interim cleanup levels for groundwater have been set based upon the ARARS (e.g., Federal Drinking Water MCLGs and MCLs, and Vermont Groundwater Quality Standards) as available, or other suitable criteria.

A comparison of the interim groundwater cleanup levels listed in the ROD with current federal MCLs and state groundwater protection criteria was conducted (see Table2 and 3). The current groundwater protection criteria for tetrachloroethene, chromium (as hexavalent), and manganese have increased above the values presented in the ROD. Tetrachloroethene has increased from 0.0007 mg/L to 0.005 mg/L, and chromium has increased from 0.05 mg/L to 0.1 mg/L. The interim clean up value for manganese was 0.180 mg/L and was a calculated risk-based value. Due to the change in the RfD for manganese the risk-based level has increased to 0.3 mg/L. It should be noted however that Vermont has a secondary VPQGS for manganese of 0.05 mg/L. Per Chapter 12: Ground Water Protection Rule and Strategy (State of Vermont, Agency of Natural Resources, Department of Environmental Conservation, January 20, 2000):

> "An activity shall not cause the ground water quality to reach or exceed the secondary enforcement standards or 110% of the secondary background ground water quality standards established under 12-704, whichever is greater"

The current protection criterion for acetone has decreased from the values presented in the ROD. Acetone's interim cleanup level was a calculated risk-based value of 3.7 mg/L due to the lack of federal or state criteria. The current VPQGS for acetone is 0.7 mg/L. The MCL for arsenic has changed to 0.01 mg/L per the SDWA. Vermont has also recently revised its enforcement standard for 1,4-dioxane from 20 ppb to 3 ppb. Other values listed in the ROD are current. It may be necessary to update the ROD IGCLs in the future to accommodate these changes, both more stringent and less stringent than those applied in the ROD, depending on review of groundwater quality data as the remedy progresses.

7.2.2 Ecological Risk Review

EPA's ecological risk assessment evaluated potential risks associated with stream and river surface water, stream sediment, and surface soil within the IWS areas. EPA ambient water quality criteria and available sediment screening benchmarks were used to evaluate chemical toxicity to ecological receptors. Surface soils were evaluated by estimating exposure doses received by various indicator species representing different foraging guilds. These doses were then compared to toxicity data obtained from the scientific literature.

The ecological risk assessment concluded that surface water quality in the unnamed stream may be impacted by elevated concentrations of iron and silver. Sediment concentrations of barium, cyanide and manganese were elevated above screening benchmarks but the results of macrobenthic invertebrate community sampling concluded that surface water and sediment contamination within the stream are unlikely to have resulted in adverse impacts to resident aquatic biota.

Risks to terrestrial receptors exposed to contaminants in surface soil were assessed by modeling exposures to three indicator species. Based on the modeling, the ecological risk assessment concluded that concentrations of metals in the IWS area surface soils may impact shrew (insectivores), while herbivores (e.g., meadow voles) and higher trophic levels (e.g., red fox) are unlikely to be affected.

Because surface soils within the SWDA and IWS areas have been consolidated and capped, there is no longer a complete ecological exposure pathway between receptors and surface soils. As long as the caps are maintained, this exposure pathway will remain incomplete.

As part of long-term monitoring activities required by the ROD, sampling and analysis of sediments has been performed twice in the past 5 years at three locations (SD01, SD02, and SD03) in the unnamed stream, including once in April/October 2005 and again in September 2008. Section 6.4.1 discussed the comparison of maximum concentrations detected in the long-term monitoring samples collected in the unnamed stream to the project-specific sediment quality guidelines established for the Site in the risk assessment. The 1993 ecological risk assessment concluded that barium, cyanide, and manganese concentrations were elevated above benchmarks but were unlikely to result in adverse effects to resident aquatic organisms. Cyanide has been removed from the long-term monitoring program because the one sample location where an elevated concentration was detected had been disturbed during the construction of the cap. Maximum barium and manganese concentrations are lower than detected during the RI. Therefore, the potential for ecological impacts has decreased and the remedy remains protective with respect to sediment exposure to aquatic receptors.

Surface water sampling along the unnamed stream has been performed at three locations on an annual basis from April 2004 to the present. The locations of stream surface water samples (SW01, SW02, and SW03) were co-located with the sediment sample locations (SD01, SD02, and SD3). Section 6.4.2 discusses the comparison of maximum concentrations detected in the long-term monitoring samples collected in the unnamed stream to national recommended water quality criteria. The 1993 ecological risk assessment concluded that aquatic biota in the unnamed stream may be impacted by elevated concentrations of iron and silver. However, surface water concentrations of silver have decreased in the unnamed stream to non-detectable levels and the maximum 2005-2009 iron concentration is more than 30-fold lower than the maximum RI iron concentration. Therefore, the potential for ecological impacts has decreased and the remedy remains protective with respect to surface water exposures.

7.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No. From all of the activities conducted as part of this five-year review, no new information has come to light which would call into question the protectiveness of the landfill cap or groundwater remedies.

8.0 PROGRESS SINCE LAST FIVE-YEAR REVIEW

The following actions have been taken since the last five year review:

Table 10: Actions Taken Since the Last Five Year Review

Issue	Recommendations and Follow-up Actions	Party Responsible	Milestone Date	Actions Taken and Outcome	Date of Action
Landfill Gas	Install new gas probes to define extent, and continue monitoring	PRP	9/05	Gas probes installed during two events and monitored periodically	October 2004 and August 2006
Construction of groundwater remedy	Construct the groundwater remedy	PRP	9/05	Groundwater remedies constructed	September 2005
1,4 Dioxane	Continue to monitor and define the extent of 1,4-dioxane to ensure the plume is within the groundwater IC buffer zone	PRP	TBC	A new groundwater monitoring well cluster was installed outside of the groundwater IC buffer zone, indicating no detections of 1,4-dioxane	June 2008

Action items that have not been completed since the last five year review include the finalization of institutional controls and the evaluation of the need to update the acetone IGCL. Both of these issues are discussed in this five year review report.

9.0 ISSUES

Based on the activities conducted during this Five-Year Review, the issues identified in Table 11 have been noted:

Table 11: Issues		
Issues	**Affects Current Protectiveness**	**Affects Future Protectiveness**
In accordance with the ROD, institutional controls were to be implemented as part of the selected remedy. To date the institutional controls for the site have not been finalized.	N	Y
The VPGQS and/or MCLs for acetone and arsenic were revised and are currently more stringent than during the ROD.	N	Y
1,4-Dioxane was detected in site groundwater above VPGQS but not evaluated in the risk assessment.	N	Y
The groundwater trends analysis indicates that concentrations of several VOCs are increasing indicating that groundwater monitoring should continue in the vicinity of occupied buildings to ensure that concentrations do not increase to levels exceeding the vapor intrusion screening criteria.	N	Y

10.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

In response to the issues noted above, it is recommended that the actions listed in Table 12 be taken:

Table 12: Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness	
					Current	Future
Institutional Controls	Finalization of institutional controls for the Site, ensuring that the institutional control boundary encompasses wells with IGCL exceedances	PRP	EPA/VTDEC	September 2010	N	Y
Updated VPGQS and/or MCL for Acetone and Arsenic	Evaluate need to update IGCL and consider effects on treatment technologies	PRP	EPA/VTDEC	September 2011	N	Y
1,4-Dioxane	Continue to monitor and define the extent of 1,4-dioxane to ensure the plume is within the groundwater ICs	PRP	EPA/VTDEC	September 2013	N	Y
Vapor Intrusion	Continue to evaluate VOCs in groundwater against appropriate federal and state vapor intrusion guidance and criteria	PRP	EPA/VTDEC	September 2013	N	Y

11.0 PROTECTIVENESS STATEMENT

The remedy at the Parker Landfill Site currently protects human health and the environment because there is no current use of or exposure to site media containing contaminant concentrations exceeding applicable criteria. However, in order for the remedy to be protective in the long-term, institutional controls must be finalized.

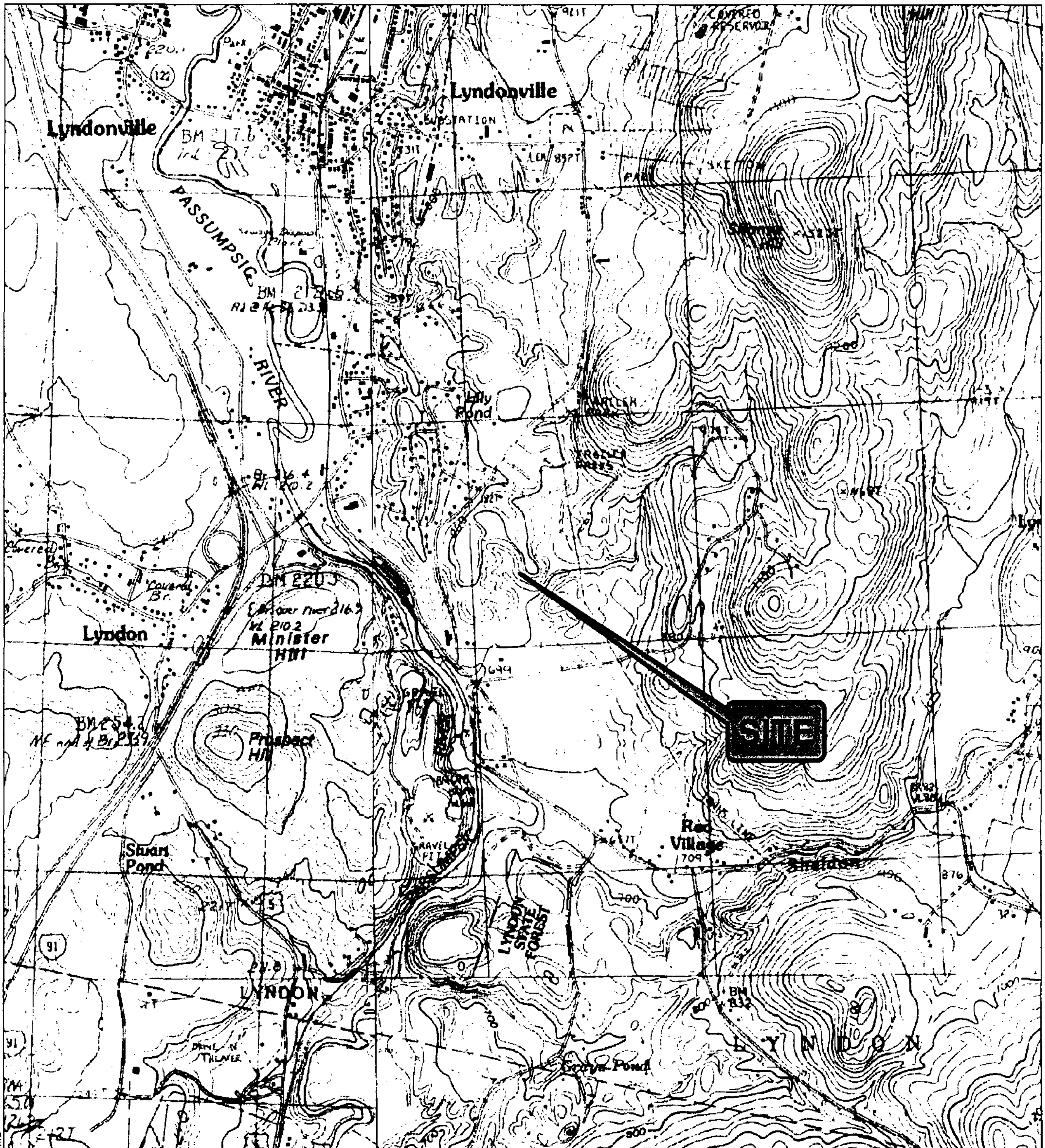
12.0 NEXT REVIEW

The due date for this second five-year review of the Parker Landfill Site is September 30, 2009. Therefore, the next five-year review should be completed by September 30, 2014.

ATTACHMENTS

ATTACHMENT 1

SITE MAPS AND FIGURES

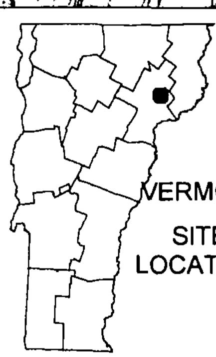


Base map: USGS 7.5 Minute Topographic Quadrangles Lydonville (1986), Burke Mtn (1988), Concord (1988), and W St Johnsbury (1983)

R:\Projects\GIS_2009\104161_Lydonville_VT\MXD\FIG1.mxd

N

0 1,000 2,000 Feet



VERMONT

SITE LOCATION

FIGURE 1

SITE LOCATION MAP

PARKER LANDFILL
LYDONVILLE, VERMONT

AECOM

TRC

Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
978-970-5600

TRC PROJ NO.: 104161

EPA CONTRACT NO.: 68 -W-0042

RAC SUBCONTRACT No.: 107061

LEGEND

B120C	▼	MANAGEMENT OF MIGRATION WELL GROUP (ANNUAL SAMPLING)
B120A	▼	MANAGEMENT OF MIGRATION WELL GROUP (5-YEAR SAMPLING)
SW03		SURFACE WATER SAMPLE LOCATION (ANNUAL SAMPLING)
SD03	◆	SEDIMENT SAMPLE LOCATION (5-YEAR SAMPLING)
B161B		PERMEABLE REACTIVE BARRIER/ BIO-ENHANCED NATURAL ATTENUATION MONITORING WELL GROUP
		HYDRAULIC ELEVATION MONITORING WELL GROUP

SOURCES.

WELL LOCATIONS SURVEYED BY URS CORPORATION BETWEEN MARCH 2000 AND OCTOBER 2005.

COLOR ORTHOPHOTO FROM NATIONAL AGRICULTURAL IMAGERY PROGRAM, VERMONT CENTER FOR GEOGRAPHIC INFORMATION, INC. IMAGE COLLECTED IN 2003

NOTE:
BASE MAP WAS PREPARED FROM A PLAN PROVIDED TO TRC BY URS CORPORATION OF PORTLAND MAINE ENTITLED "SITE PLAN AND MONITORING LOCATIONS" FIGURE NO. 2, DATED JAN 2009, ORIGINAL SCALE 1"=400 FEET.

0 400 800
SCALE IN FEET

FIGURE 2
SITE PLAN AND
MONITORING WELL LOCATIONS

PARKER LANDFILL
LYNDONVILLE, VERMONT

AECOM

TRC
Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
(978) 970-5600

TRC PROJ NO 104161-0110-001B45

EPA CONTRACT NO 68-W6-0042

FILE: T:\E_CAD\104161\parker\2009_TRC_5-YearReview_trc.DWG

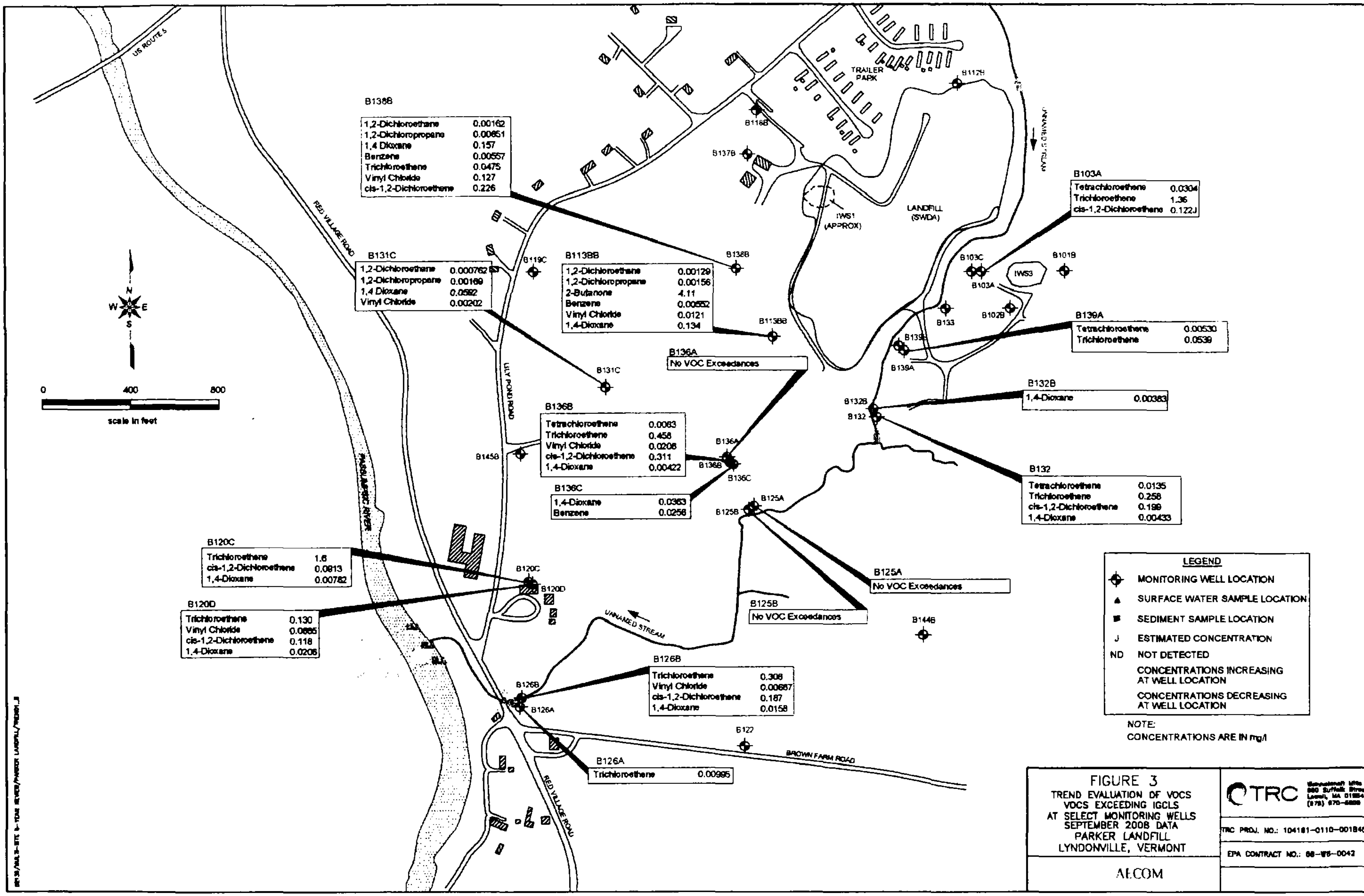


FIGURE 3
TREND EVALUATION OF VOCS
VOCS EXCEEDING IGCLS
AT SELECT MONITORING WELLS
SEPTEMBER 2008 DATA
PARKER LANDFILL
LYNDONVILLE, VERMONT

B113BB (mg/l)	IGCL	PKR-GW-B113BB 09/24/08	PKR-GW-B113BBD 09/24/08
1,2-Dichloroethene	0.0005	0.00500 U	[0.00129]
1,2-Dichloropropane	0.0006	0.00500 U	[0.00156]
1,4-Dioxane	0.003	[0.134]	[0.0896]
2-Butanone (MEK)	0.170	[3.46]	[4.11]
Benzene	0.005	[0.00517] J	[0.00552]
Methylene Chloride	0.005	0.0500 U	0.00500 U
Vinyl chloride	0.002	[0.0121]	[0.00792]

B137B (mg/l)	IGCL	PKR-GW-B137B 09/25/08
1,2-Dichloroethene	0.0005	[0.00405]
1,4-Dioxane	0.003	[0.00501]
Benzene	0.005	[0.00789]

B138B (mg/l)	IGCL	PKR-GW-B138B 09/24/08	PKR-GW-B138BD 09/24/08
1,2-Dichloroethene	0.0005	[0.00180]	[0.00162]
1,2-Dichloropropane	0.0006	[0.00824]	[0.00831]
1,4-Dioxane	0.003	[0.150]	[0.137]
Benzene	0.005	[0.00545]	[0.00557]
Trichloroethene	0.005	[0.0461]	[0.0475]
Vinyl chloride	0.002	[0.127]	[0.118]
cis-1,2-Dichloroethene	0.070	[0.228]	[0.220]

B138B (mg/l)	IGCL	PKR-GW-B138B 09/24/08
1,4-Dioxane	0.003	[0.00422] J
Tetrachloroethene	0.0007	[0.00830]
Trichloroethene	0.005	[0.458]
Vinyl chloride	0.002	[0.0206]
cis-1,2-Dichloroethene	0.070	[0.311]

B119C (mg/l)	IGCL	PKR-GW-B119C 09/25/08
1,2-Dichloroethene	0.0005	[0.000525]
1,4-Dioxane	0.003	[0.00598]

B119D (mg/l)	IGCL	PKR-GW-B119D 09/25/08
1,2-Dichloroethene	0.0005	[0.000899]

B131C (mg/l)	IGCL	PKR-GW-B131C 09/25/08	PKR-GW-B131CD 09/25/08
1,2-Dichloroethene	0.0005	[0.000762]	[0.000760]
1,2-Dichloropropane	0.0006	[0.00169]	[0.00169]
1,4-Dioxane	0.003	[0.0592]	[0.0504]
Vinyl chloride	0.002	0.00186	[0.00202]

B145C (mg/l)	IGCL	PKR-GW-B145C 09/24/08
1,2-Dichloropropane	0.0006	[0.00134]
1,4-Dioxane	0.003	[0.00893] J
Benzene	0.005	[0.0382]

B145B (mg/l)	IGCL	PKR-GW-B145B 09/24/08
1,2-Dichloropropane	0.0006	[0.00115]
1,4-Dioxane	0.003	[0.00375] J

B120D (mg/l)	IGCL	PKR-GW-B120D 09/25/08
1,4-Dioxane	0.003	[0.0206]
Trichloroethene	0.005	[0.130]
Vinyl chloride	0.002	[0.0886]
cis-1,2-Dichloroethene	0.070	[0.118]

B120C (mg/l)	IGCL	PKR-GW-B120C 09/25/08
1,4-Dioxane	0.003	[0.00782]
Tetrachloroethene	0.0007	[0.0136]
Trichloroethene	0.005	[1.60]
cis-1,2-Dichloroethene	0.070	[0.0913] J

B201OW (mg/l)	IGCL	PKR-GW-B201OW 09/24/08
1,4-Dioxane	0.003	[0.00600]

B126B (mg/l)	IGCL	PKR-GW-B126B 09/24/08
1,4-Dioxane	0.003	[0.0158]
Trichloroethene	0.005	[0.306]
Vinyl chloride	0.002	[0.00657]
cis-1,2-Dichloroethene	0.070	[0.187]

B126A (mg/l)	IGCL	PKR-GW-B126A 09/24/08
Trichloroethene	0.005	[0.00895]

B126S (mg/l)	IGCL	PKR-GW-B126S 09/24/08
1,4-Dioxane	0.003	[0.0137]

B103A (mg/l)	IGCL	PKR-GW-B103A 09/26/08
Tetrachloroethene	0.0007	[0.0304]
Trichloroethene	0.005	[1.36]
cis-1,2-Dichloroethene	0.070	[0.122] J

B160C (mg/l)	IGCL	PKR-GW-B160C 09/26/08
1,4-Dioxane	0.003	[0.0120]
Trichloroethene	0.005	[0.00630]

B160B (mg/l)	IGCL	PKR-GW-B160B 09/26/08
1,4-Dioxane	0.003	[0.00554]
Tetrachloroethene	0.0007	[0.00172]
Trichloroethene	0.005	[0.0884]

B160A (mg/l)	IGCL	PKR-GW-B160A 09/26/08
Tetrachloroethene	0.0007	[0.00452]
Trichloroethene	0.005	[0.0621]

B139A (mg/l)	IGCL	PKR-GW-B139A 09/25/08
Tetrachloroethene	0.0007	[0.00530]
Trichloroethene	0.005	[0.0639]

B132B (mg/l)	IGCL	PKR-GW-B132B 09/25/08
1,4-Dioxane	0.003	[0.00383]

B132 (mg/l)	IGCL	PKR-GW-B132 09/25/08
1,4-Dioxane	0.003	[0.00433]
Tetrachloroethene	0.0007	[0.0135]
Trichloroethene	0.005	[0.258]
cis-1,2-Dichloroethene	0.070	[0.199]

B136C (mg/l)	IGCL	PKR-GW-B136C 09/24/08
1,4-Dioxane	0.003	[0.0363]
Benzene	0.005	[0.0256]

B144A (mg/l)	IGCL	PKR-GW-B144A 09/24/08
1,4-Dioxane	0.003	[0.0314]

B144B (mg/l)	IGCL	PKR-GW-B144B 09/24/08
1,4-Dioxane	0.003	[0.00301] J

LEGEND

B120C ▼	MANAGEMENT OF MIGRATION WELL GROUP (ANNUAL SAMPLING)
B120A ▼	MANAGEMENT OF MIGRATION WELL GROUP (5-YEAR SAMPLING)
(mg/l)	MILLIGRAMS PER LITER
IGCL	INTERIM GROUNDWATER CLEANUP LEVEL
[ ]	CONCENTRATION EXCEEDS IGCL
	SHALLOW OVERBURDEN
	TOP-OF-ROCK
	BEDROCK

DRAFT

NOTE.
BASE MAP WAS PREPARED FROM A PLAN PROVIDED TO TRC BY URS CORPORATION OF PORTLAND MAINE ENTITLED "EXCEEDANCES OF IGCLs IN GROUNDWATER FOR MANAGEMENT OF MIGRATION MONITORING WELL GROUP" FIGURE NO. 7, DATED JAN 2009, ORIGINAL SCALE 1"=400 FEET

0 400 800
SCALE IN FEET

FIGURE 4
SEPTEMBER 2008 EXCEEDANCES OF IGCLs IN GROUNDWATER FOR MANAGEMENT OF MIGRATION MONITORING WELL GROUP
PARKER LANDFILL
LYNDONVILLE, VERMONT

TRC
Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
(978) 970-5600

TRC PROJ. NO. 104161-0110-001B45

EPA CONTRACT NO. 68-W6-0042

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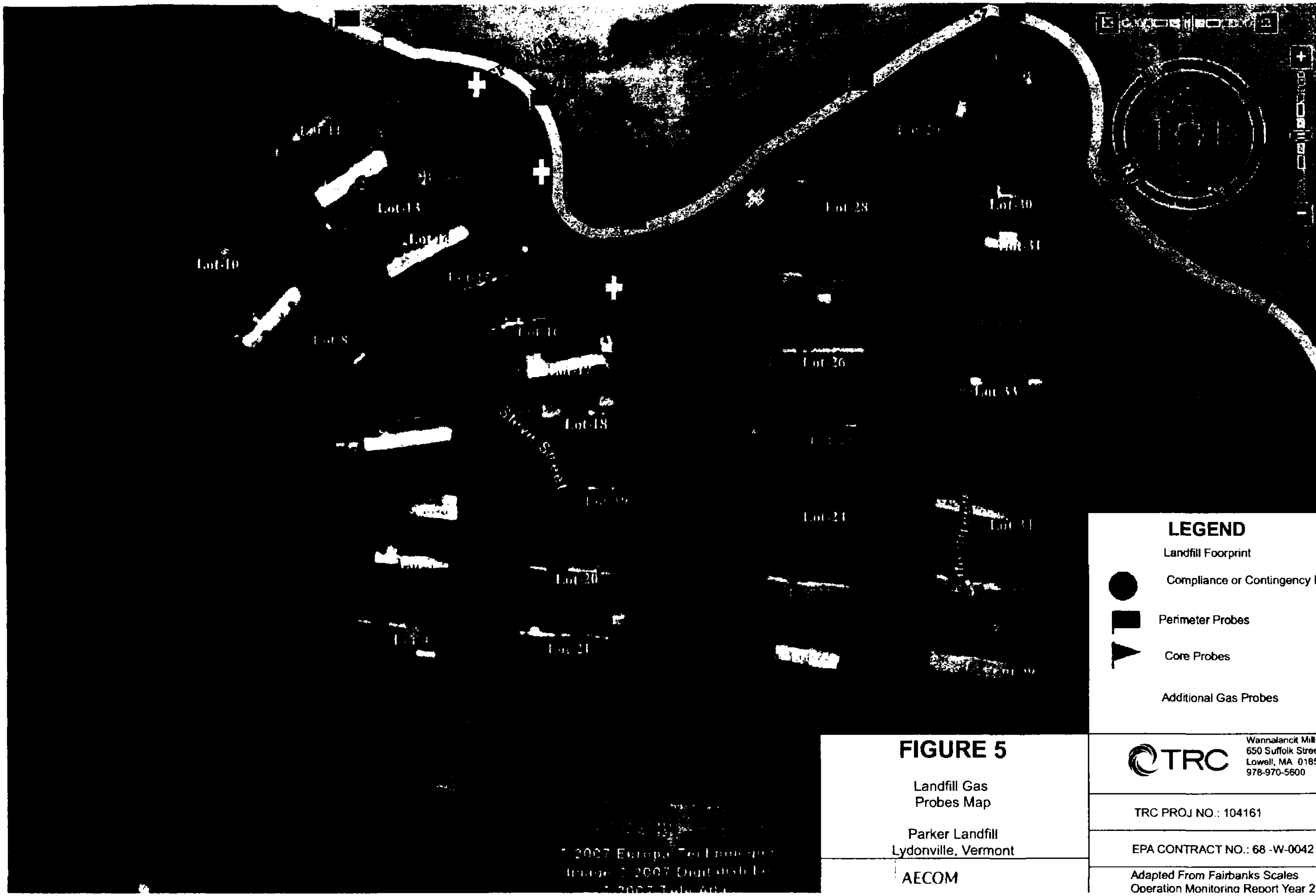


LEGEND

Landfill Foorprint

Compliance or Contingency Probes

Perimeter Probes

Core Probes

Additional Gas Probes

FIGURE 5

Landfill Gas
Probes Map

Parker Landfill
Lydonville, Vermont

AECOM

TRC

Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
978-970-5600

TRC PROJ NO.: 104161

EPA CONTRACT NO.: 68 -W-0042

Adapted From Fairbanks Scales
Operation Monitoring Report Year 2008

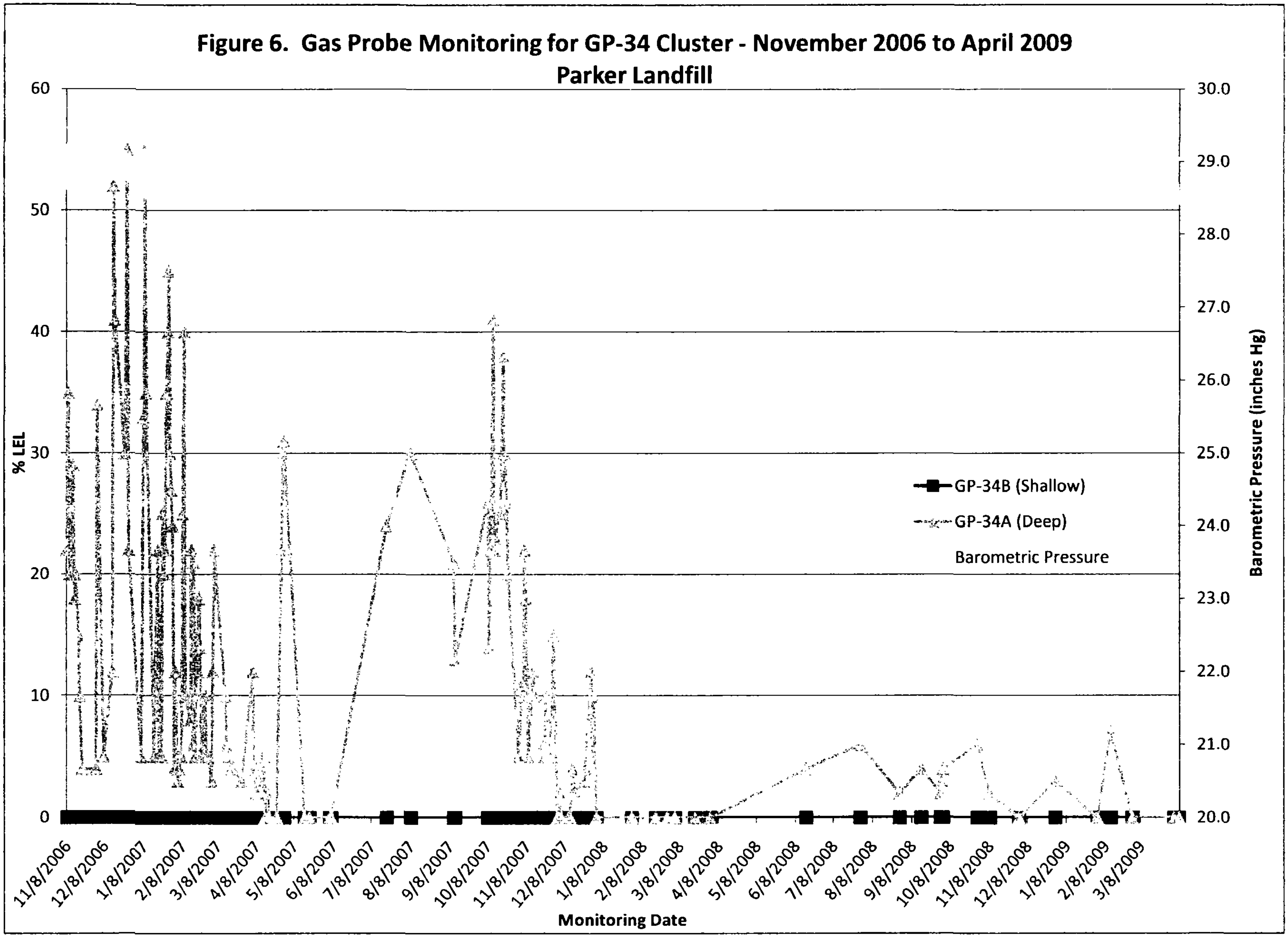


Figure 6. Gas Probe Monitoring for GP-34 Cluster - November 2006 to April 2009
Parker Landfill
% LEL
Barometric Pressure (inches Hg)
Monitoring Date
GP-34B (Shallow)
GP-34A (Deep)
Barometric Pressure
0
10
20
30
40
50
60
20.0
21.0
22.0
23.0
24.0
25.0
26.0
27.0
28.0
29.0
30.0
11/8/2006
12/8/2006
1/8/2007
2/8/2007
3/8/2007
4/8/2007
5/8/2007
6/8/2007
7/8/2007
8/8/2007
9/8/2007
10/8/2007
11/8/2007
12/8/2007
1/8/2008
2/8/2008
3/8/2008
4/8/2008
5/8/2008
6/8/2008
7/8/2008
8/8/2008
9/8/2008
10/8/2008
11/8/2008
12/8/2008
1/8/2009
2/8/2009
3/8/2009

ATTACHMENT 2

LIST OF DOCUMENTS REVIEWED

LIST OF DOCUMENTS REVIEWED

- Administrative Order by Consent for Remedial Investigation/Feasibility Study, prepared by EPA Region 1 and signed August 10, 1990.
- Declaration for the Record of Decision, prepared by EPA Region 1 and signed on April 4, 1995.
- Parker Landfill Unilateral Administrative Order for Remedial Design and Remedial Action, prepared by EPA Region 1 and signed on April 26, 1999. (includes Appendix A, Statement of Work for Remedial Design/Remedial Action, April 1999).
- Declaration for the Explanation of Significant Differences, prepared by EPA Region 1 and signed on July 21, 2004.
- Final Five-Year Review Technical Memorandum, First Five-Year Review Report for Parker Landfill Superfund Site, Prepared by Metcalf & Eddy/TRC for U.S. EPA, September 2004.
- Gas Probe Monitoring Program and Contingency Plan. Sanborn, Head & Associates, Inc., Revised February 2005.
- Updated Draft Final Long-Term Monitoring Plan. URS Corporation, September 8, 2006.
- Draft 2004, 2005, 2006, 2007, and 2008 Annual Monitoring Reports. URS Corporation.
- Operation and Monitoring Report – Years 2006, 2007, and 2008. Fairbanks Scales.
- Other References:
  - U. S. Environmental Protection Agency (USEPA), 2009a. *Regional Screening Levels Table.* Oak Ridge National Laboratories. U.S. EPA. http://epa-prgs.ornl.gov/chemicals/index.shtml April 2009.
  - U. S. Environmental Protection Agency (USEPA), 2009b. *Integrated Risk Information System (IRIS).* On-line Database. July 2009.
  - U.S. Environmental Protection Agency (USEPA). 2002. *OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance).* November 2002. http://www.epa.gov/osw/hazard/correctiveaction/eis/vapor/complete.pdf

ATTACHMENT 3

INTERVIEW DOCUMENTATION

INTERVIEW DOCUMENTATION FORM

The following is a list of individual interviewed for this five-year review. See the attached contact record(s) for a detailed summary of the interviews.

Name	Title/Position	Organization	Date
John Schmeltzer	Project Manager	VTDEC	July 31, 2009
Bill Webb	Dir. Of Ops	Fairbanks Scales, Inc.	July 30, 2009
Eric Chadburn	Env. Coord.		
Jason Clere	Principal Engineer	URS	July 23, 2009
Justin Smith	Zoning Dept.	Town of Lyndonville	July 27, 2009

INTERVIEW RECORD

Site Name: Parker Landfill		**EPA ID No.:**
Subject: Five-year review		**Time:** 1:30 pm / **Date:** 7/31/09
Type: Telephone X Visit Other **Location of Visit:**		Incoming Outgoing X
Contact Made By:		
Name: Laurie O'Connor	**Title:** Project Manager	**Organization:** TRC Environmental
Individual Contacted:		
Name: John Schmeltzer	**Title:** Project manager	**Organization:** VTDEC
Telephone No: 802-241-3886 **Fax No:** **E-Mail Address:**	**Street Address:** 103 South Main Street, West Building **City, State, Zip:** Waterbury, Vermont 05671-0404	

Summary Of Conversation

Q1 What is your overall impression of the project?
A1 The Site is going well. The remedial actions appear to be working. He understands that another BNA injection is needed and will be conducted in the near future. He is interested to see if there will be a response or reduction in contamination after the injection.

Q2 Have there been any complaints, violations, or other incidents related to the site requiring a response by your office?
A2 There have been discussions with some of the landowners that were included in the "Institutional Controls Area" regarding land use.

Q3 Are there any active community groups?
A3 Not that he's aware of.

Q4 Do you feel well informed about the site's activities and progress?
A4 Yes.

Q5 Is there anyone using the impacted groundwater near the site?
A5 Not to his knowledge.

Q6 What do you see as upcoming issues for the Parker Landfill?
A6 He is concerned with ensuring that the institutional controls are maintained. He is also concerned with the effectiveness of the BNA remedy.

INTERVIEW RECORD

Site Name: Parker Landfill	**EPA ID No.:**	
Subject: Five-year review	**Time:** 10:00 am	**Date:** 7/30/09
Type: Telephone X Visit Other **Location of Visit:**	Incoming **Outgoing X**	

Contact Made By:

Name: Laurie O'Connor	**Title:** Project Manager	**Organization:** TRC Environmental

Individual Contacted:

Name: Jason Clere	**Title:** Principal Engineer	**Organization:** URS
Telephone No: 207-879-7686 **Fax No:** **E-Mail Address:**	**Street Address:** 115 Water Street **City, State, Zip:** Hallowell, ME 04347	

Summary Of Conversation

Q1 What is your overall impression of the project?
A1 Positive.

Q2 Are the groundwater remedies functioning as expected? How well is the remedy performing?
A2 Yes. Both remedies are functioning as expected and performing well.

Q3 Have there been any significant changes to the monitoring for either of the PRB or BNA system since startup?
A3 Yes, there has, but all changes have been performed in accordance with the long term monitoring plan (LTMP). The PRB monitoring was more frequent for a few years following startup, but that has recently been scaled down to annual monitoring.

Q4 Have there been any unexpected difficulties with respect to continued operation/implementation of the groundwater remedies?
A4 No. There have not been any unexpected difficulties with the remedies.

Q5 What are your most recent projections for achieving cleanup overall or in either of the treatment areas?
A5 The cleanup projections have not been revisited since they were provided in the design documents. However, we are seeing marked reductions in COCs since the BNA system has been online. This is consistent with the modeling that was performed.

Q6 Do you have any recommendations for reducing or increasing activities at the Site?
A6 Not at this time.

Q7 When comparing to IGCLs, do you use the numbers provided in the ROD or are the IGCLs updated as MCLs and VT standards are updated?
A7 IGCLs have been updated periodically as the MCLs and VT standards have been revised. The list has expanded to include 1,4-dioxane, which now has an IGCL.

INTERVIEW RECORD

Site Name: Parker Landfill	**EPA ID No.:**
Subject: Five-year review	**Time:** **1:00 pm** / **Date: 7/23/09**
Type: **Telephone** X Visit Other **Location of Visit:**	Incoming **Outgoing X**

Contact Made By:

Name: Laurie O'Connor	**Title:** Project Manager	**Organization:** TRC Environmental

Individual Contacted:

Name: Bill Webb Eric Chadburn	**Title:** Director of Operations Environmental Coordinator	**Organization:** Fairbanks Scales
Telephone No: 802-473-5260 **Fax No:** **E-Mail Address:**	**Street Address:** 2176 Portland Street **City, State, Zip:** St. Johnsbury, VT 05824	

Summary Of Conversation

Q1 What is your overall impression of the project?
A1 Overall, it is very good now.

Q2 Have there been any significant changes to the O&M of the landfill within the past 5 years?
A2 Yes. There has been the addition of a new SCADA system, so now the burning of the methane gas can be controlled better. The mowing is more consistent and there is no more erosion. There were also tears in the membranes around three of the gas collection wells (the ones that had the settling). That was more of a one time repair than a change to O&M.

Q3 Have there been any unexpected difficulties with continued O&M of the landfill?
A3 No

Q4 Do you have any recommendations for reducing or increasing activities at the Site?
A4 They have reduced activities at the Site as much as possible. Now they would like to start talking about measuring and monitoring methane remotely at the wells and possibly at the intake. They would like to do this so that they will be prepared when the time comes that there is not enough methane to burn and will have a plan in place to deal with it effectively and efficiently.

INTERVIEW RECORD

Site Name: Parker Landfill	**EPA ID No.:**	
Subject: Five-year review	**Time: 3:05 pm**	**Date: 8/23/04**
Type: Telephone Visit Other X email **Location of Visit:**	**Incoming X** Outgoing X	

Contact Made By:

Name: Laurie O'Connor	**Title: Project Manager**	**Organization:** TRC Environmental

Individual Contacted:

Name: Justin Smith	**Title: Zoning Department**	**Organization:** Town of Lyndonville
Telephone No: 802-626-1269 **Fax No:** **E-Mail Address: lynzoning@kingcon.com**	**Street Address:** Zoning Department **City, State, Zip:** Lyndonville, Vermont	

Summary Of Conversation

Q1: Are you familiar with the site and the institutional controls (IC) being implemented to restrict use of groundwater?
A1: Yes

Q2: Have any new areas/roads been included in the zoning ordinance within the last five years?
A2: No

Q3: In 2003, the State of Vermont reclassified groundwater from Class III to Class IV. Is the Town of Lyndonville working to expand the "Institutional Control Area"?
A3: Yes

Q4: Do the houses within the new development on Brown Farm Road have basements?
A4: Yes, all of the houses within that development have full basements.

ATTACHMENT 4

FIVE-YEAR REVIEW SITE INSPECTION

Parker Landfill 5-Year Review

Site Inspection June 23, 2009

Name	Company/Agency	Address	Phone No.
JASON CLERE	URS CORP	477 CONGRESS ST, STE 900 PORTLAND ME 04101	207 879-7686
Eric Chadborn	Fairbanks Scales	2176 Portland St. Saint Johnsbury VT 05819	802 473 5253
Bill Webb	Fairbanks Scale	" "	802-473-5260
Laurie O'Connor	TRC	Lowell, MA	978-656-3512
Amy Hamilton	TRC	Lowell, MA	978-656-3517
John Schmeltzer	VT ANR	Waterbury VT	802 241-3886

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION

Site name: Parker Landfill	**Date of inspection:** 6/23/09
Location and Region: Lyndonville, VT	**EPA ID:**
Agency, office, or company leading the five-year review:	**Weather/temperature:** high 70's, clear, sunny

Remedy Includes: (Check all that apply)

- ✓ Landfill cover/containment
- ✓ Access controls
- ✓ Institutional controls
- Groundwater pump and treatment
- Surface water collection and treatment
- Other
- ✓ Monitored natural attenuation (enhanced)
- Groundwater containment
- ✓ Vertical barrier walls (passive reactive treatment wall)

Attachments: Inspection team roster attached ✓ Site map attached

II. INTERVIEWS (Check all that apply) *

1. O&M site manager (landfill) Bill Webb — Name; Dir. of Operations — Title; 7/23/09 — Date
   Interviewed at site at office by phone Phone no. ______
   Problems, suggestions; Report attached
   Fairbanks Scales

2. O&M staff (landfill) Eric Chadburn — Name; Env. Coordinator — Title; 7/23/09 — Date
   Interviewed at site at office by phone Phone no. ______
   Problems, suggestions; Report attached
   Fairbanks Scales

* Representatives of VTDEC and the PRPs were onsite during the inspection and were asked questions. Separate interviews were conducted via telephone after the site inspection

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency VTDEC
Contact John Schmeitzer | Project Manager | |
Name | Title | Date | Phone no.
Problems; suggestions; Report attached

Agency
Contact
Name | Title | Date | Phone no.
Problems; suggestions; Report attached

Agency
Contact
Name | Title | Date | Phone no.
Problems; suggestions; Report attached

Agency
Contact
Name | Title | Date | Phone no.
Problems; suggestions; Report attached

4. **Other interviews** (optional) Report attached.

Jason Clere - URS

Justin Smith - Town of Lyndonville Zoning Dept.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply) X

1. **O&M Documents**
   - O&M manual — Readily available — Up to date — X N/A
   - As-built drawings — Readily available — Up to date — X N/A
   - Maintenance logs — Readily available — Up to date — X N/A
   - Remarks ______

2. **Site-Specific Health and Safety Plan** — Readily available — Up to date — X N/A
   - Contingency plan/emergency response plan — Readily available — Up to date — X N/A
   - Remarks ______

3. **O&M and OSHA Training Records** — Readily available — Up to date — X N/A
   - Remarks ______

4. **Permits and Service Agreements**
   - Air discharge permit — Readily available — Up to date — X N/A
   - Effluent discharge — Readily available — Up to date — X N/A
   - Waste disposal, POTW — Readily available — Up to date — X N/A
   - Other permits ______ — Readily available — Up to date — X N/A
   - Remarks ______

5. **Gas Generation Records** — Readily available — Up to date — N/A
   - Remarks Quarterly reports are submitted to EPA

6. **Settlement Monument Records** — Readily available — Up to date — X N/A
   - Remarks ______

7. **Groundwater Monitoring Records** — Readily available — Up to date — N/A
   - Remarks Annual reports are generated + submitted to EPA to report groundwater results

8. **Leachate Extraction Records** — Readily available — Up to date — X N/A
   - Remarks ______

9. **Discharge Compliance Records**
   - Air — Readily available — Up to date — X N/A
   - Water (effluent) — Readily available — Up to date — X N/A
   - Remarks ______

10. **Daily Access/Security Logs** — X Readily available — X Up to date — N/A
    - Remarks A log is kept in the small office near the flare.

* A secure building is not available at the site to store documents. All documents are located either at Fairbanks Scales' office in St. Johnsbury, VT or at URS's office in Portland, ME

IV. O&M COSTS

1. **O&M Organization**
   State in-house — Contractor for State
   ✓ PRP in-house — ✓ Contractor for PRP
   Federal Facility in-house — Contractor for Federal Facility
   Other ______

2. **O&M Cost Records** NA
   Readily available — Up to date
   Funding mechanism/agreement in place
   Original O&M cost estimate ______ Breakdown attached

   Total annual cost by year for review period if available

From ______ (Date)	To ______ (Date)	______ (Total cost)	Breakdown attached
From ______ (Date)	To ______ (Date)	______ (Total cost)	Breakdown attached
From ______ (Date)	To ______ (Date)	______ (Total cost)	Breakdown attached
From ______ (Date)	To ______ (Date)	______ (Total cost)	Breakdown attached
From ______ (Date)	To ______ (Date)	______ (Total cost)	Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: ______

V. ACCESS AND INSTITUTIONAL CONTROLS Applicable N/A

A. Fencing

1. **Fencing damaged** Location shown on site map ✓ Gates secured N/A
   Remarks No damage observed

B. Other Access Restrictions

1. **Signs and other security measures** Location shown on site map N/A
   Remarks No trespassing signage off Brown Farm Road

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	Yes	✓ No	N/A
Site conditions imply ICs not being fully enforced	Yes	✗ No	N/A

Type of monitoring (*e.g.*, self-reporting, drive by) ______

Frequency ______

Responsible party/agency ______

Contact ______ Name ______ Title ______ Date ______ Phone no.

Reporting is up-to-date	Yes	No	N/A
Reports are verified by the lead agency	Yes	No	N/A
Specific requirements in deed or decision documents have been met	Yes	No	N/A
Violations have been reported	Yes	No	N/A

Other problems or suggestions: Report attached

2. **Adequacy** Landfill ICs are adequate Groundwater ICs are inadequate N/A

Remarks Town of Lyndonville is currently rezoning areas so that groundwater ICs will be adequate

D. General

1. **Vandalism/trespassing** Location shown on site map ✗ No vandalism evident

Remarks ______

2. **Land use changes on site** ✗ N/A

Remarks ______

3. **Land use changes off site** N/A

Remarks Assisted living facility (new homes - some have basements) built downgradient of site on Brown Farm Road

VI. GENERAL SITE CONDITIONS

A. Roads ✓ Applicable N/A

1. **Roads damaged** Location shown on site map ✗ Roads adequate N/A

Remarks Access road to IWS3 is repaired as needed

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS ☒ Applicable N/A

A. Landfill Surface

1. **Settlement** (Low spots) Location shown on site map Settlement not evident
Areal extent ______ Depth ______
Remarks Letdown channel currently being monitored (through surveying) for settlement

2. **Cracks** Location shown on site map ☒ Cracking not evident
Lengths ______ Widths ______ Depths ______
Remarks

3. **Erosion** Location shown on site map ☒ Erosion not evident
Areal extent ______ Depth ______
Remarks

4. **Holes** Location shown on site map ☒ Holes not evident
Areal extent ______ Depth ______
Remarks Animal burrows in grass noted

5. **Vegetative Cover** ☒ Grass ☒ Cover properly established ☒ No signs of stress
Trees/Shrubs (indicate size and locations on a diagram)
Remarks

6. **Alternative Cover (armored rock, concrete, etc.)** ☒ N/A
Remarks

7. **Bulges** Location shown on site map ☒ Bulges not evident
Areal extent ______ Height ______
Remarks

8. **Wet Areas/Water Damage** X Wet areas/water damage not evident
Wet areas — Location shown on site map — Areal extent________
Ponding — Location shown on site map — Areal extent________
Seeps — Location shown on site map — Areal extent________
Soft subgrade — Location shown on site map — Areal extent________
Remarks________

9. **Slope Instability** Slides Location shown on site map X No evidence of slope instability
Areal extent________
Remarks________

B. Benches X Applicable N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** Location shown on site map X N/A or okay
Remarks________

2. **Bench Breached** Location shown on site map X N/A or okay
Remarks________

3. **Bench Overtopped** Location shown on site map X N/A or okay
Remarks________

C. Letdown Channels X Applicable N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** Location shown on site map No evidence of settlement
Areal extent 20x20' Depth 6'
Remarks________

2. **Material Degradation** Location shown on site map X No evidence of degradation
Material type________ Areal extent________
Remarks________

3. **Erosion** Location shown on site map X No evidence of erosion
Areal extent________ Depth________
Remarks________

4.	**Undercutting** Location shown on site map X No evidence of undercutting Areal extent______ Depth______ Remarks______	
5.	**Obstructions** Type______ X No obstructions Location shown on site map Areal extent______ Size______ Remarks______	
6.	**Excessive Vegetative Growth** Type______ X No evidence of excessive growth X Vegetation in channels does not obstruct flow (Minor vegetation) Location shown on site map Areal extent______ Remarks______	
D.	**Cover Penetrations** X Applicable N/A	
1.	**Gas Vents** X Active Passive Properly secured/locked X Functioning X Routinely sampled X Good condition Evidence of leakage at penetration Needs Maintenance N/A Remarks______	
2.	**Gas Monitoring Probes** Properly secured/locked X Functioning X Routinely sampled X Good condition Evidence of leakage at penetration Needs Maintenance N/A Remarks______	
3.	**Monitoring Wells** (within surface area of landfill) X Properly secured/locked Functioning Routinely sampled X Good condition Evidence of leakage at penetration Needs Maintenance N/A Remarks______	
4.	**Leachate Extraction Wells** Properly secured/locked Functioning Routinely sampled Good condition Evidence of leakage at penetration Needs Maintenance X N/A Remarks______	
5.	**Settlement Monuments** Located Routinely surveyed X N/A Remarks______	

E. Gas Collection and Treatment	X Applicable	N/A	
1. **Gas Treatment Facilities**			
X Flaring	Thermal destruction	Collection for reuse	
X Good condition	Needs Maintenance		
Remarks			
2. **Gas Collection Wells, Manifolds and Piping**			
X Good condition	Needs Maintenance		
Remarks			
3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)			
Good condition	Needs Maintenance	N/A	
Remarks			
F. Cover Drainage Layer	✓ Applicable	N/A	
1. **Outlet Pipes Inspected**	X Functioning	N/A	
Remarks			
2. **Outlet Rock Inspected**	✓ Functioning	N/A	
Remarks			
G. Detention/Sedimentation Ponds	✓ Applicable	N/A	
1. **Siltation** Areal extent______	Depth______		X N/A
Siltation not evident			
Remarks			
2. **Erosion** Areal extent______	Depth______		
✓ Erosion not evident			
Remarks			
3. **Outlet Works**	X Functioning	N/A	
Remarks			
4. **Dam**	X Functioning	N/A	
Remarks			

H. Retaining Walls	Applicable	X N/A	
1.	**Deformations** Location shown on site map Deformation not evident Horizontal displacement___________ Vertical displacement_____________ Rotational displacement___________ Remarks___________		
2.	**Degradation** Location shown on site map Degradation not evident Remarks___________		
I. Perimeter Ditches/Off-Site Discharge	X Applicable	N/A	
1.	**Siltation** Location shown on site map X Siltation not evident Areal extent_____________ Depth___________ Remarks___________		
2.	**Vegetative Growth** Location shown on site map X N/A Vegetation does not impede flow Areal extent_____________ Type___________ Remarks___________		
3.	**Erosion** Location shown on site map X Erosion not evident Areal extent_____________ Depth___________ Remarks___________		
4.	**Discharge Structure** X Functioning N/A Remarks___________		
VIII. VERTICAL BARRIER WALLS	X Applicable	~~X~~ N/A	(Permable barrier for ground-water treatment)
1.	**Settlement** Location shown on site map X Settlement not evident Areal extent_____________ Depth___________ Remarks___________		
2.	**Performance Monitoring** Type of monitoring groundwater Performance not monitored Frequency quarterly - first 4 yrs, now annual Evidence of breaching Head differential___________ Remarks___________		

BNA (bioenhanced natural attenuation) system

IX. GROUNDWATER/SURFACE WATER REMEDIES	X Applicable	N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines	X Applicable	N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition All required wells properly operating Needs Maintenance N/A
   Remarks wells appear to be in good condition. They are only operated when amendment is injected, so they were not operating @ time of site visit

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks see remark in #1

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks

B. Surface Water Collection Structures, Pumps, and Pipelines Applicable X N/A

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks

C. Treatment System Applicable N/A

1. **Treatment Train** (Check components that apply)
   Metals removal Oil/water separation Bioremediation In-situ injections (periodic)
   Air stripping Carbon adsorbers
   Filters
   Additive (*e.g.*, chelation agent, flocculent)
   Others
   Good condition Needs Maintenance
   Sampling ports properly marked and functional
   Sampling/maintenance log displayed and up to date
   Equipment properly identified
   Quantity of groundwater treated annually
   Quantity of surface water treated annually
   Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ✓ N/A Good condition Needs Maintenance
   Remarks

3. **Tanks, Vaults, Storage Vessels**
   ✓ N/A Good condition Proper secondary containment Needs Maintenance
   Remarks

4. **Discharge Structure and Appurtenances**
   ✓ N/A Good condition Needs Maintenance
   Remarks

5. **Treatment Building(s)**
   ✓ N/A Good condition (esp. roof and doorways) Needs repair
   Chemicals and equipment properly stored
   Remarks

6. **Monitoring Wells** (pump and treatment remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks

D. Monitoring Data

1. Monitoring Data
   ✓ Is routinely submitted on time ✓ Is of acceptable quality

2. Monitoring data suggests:
   Groundwater plume is effectively contained ✓ Contaminant concentrations generally are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   X Properly secured/locked X Functioning X Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Landfill - cap to provide horizontal barrier to waste. The landfill is in good condition. Erosion repairs made on northeastern sideslope of landfill 4 yrs ago are stable. Settlement in letdown is monitored and it appears that settlement slowed/stabilized.
Groundwater - PRB to treat source area groundwater, BNA to treat downgradient groundwater.
All groundwater remedies appear to be functioning as intended.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

O&M is effectively upkeeping the remedy. There are some issues with animal burrows (into the grass and sand), but Fairbanks Scales tries to keep up with them by removing them from the hole(s) and filling in the hole then reseeding.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. There are none
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Fairbanks scales is planning to install automated methane monitoring in preparation for the time when the methane concentration starts reducing to below levels that the flare needs to burn.

Photo 1. Top of landfill, looking north.

Photo 2. Landfill bench, looking south

Photo 3. Woodchuck in hole near W-11 (shown in upper right).

Photo 4. Maintained landfill slope.

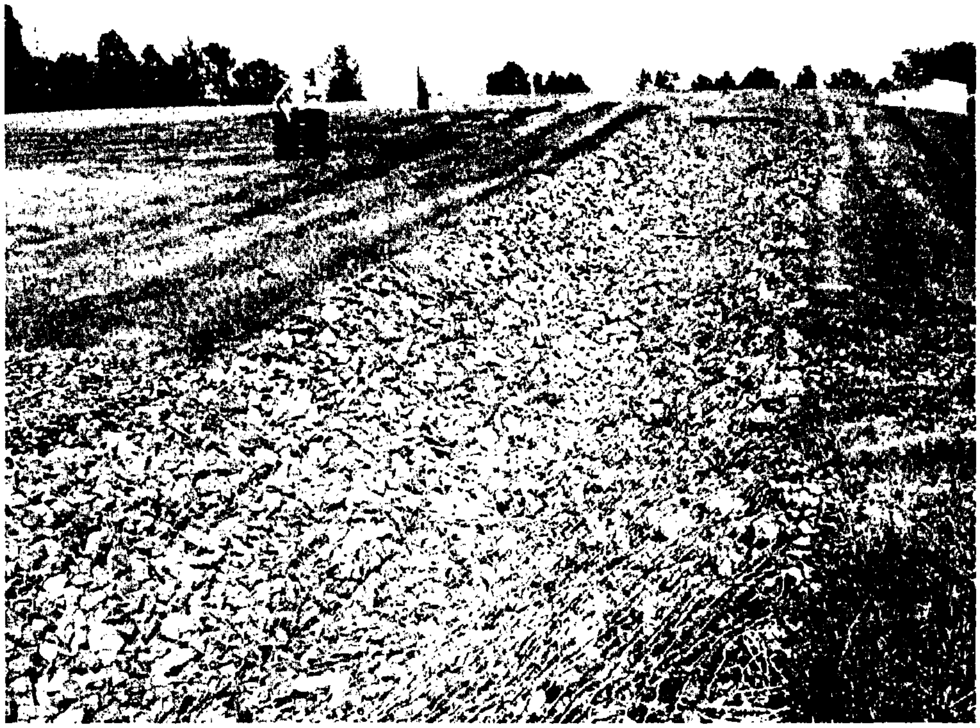


Photo 5. Downcomber # 2.

Photo 6. PRB monitoring wells.

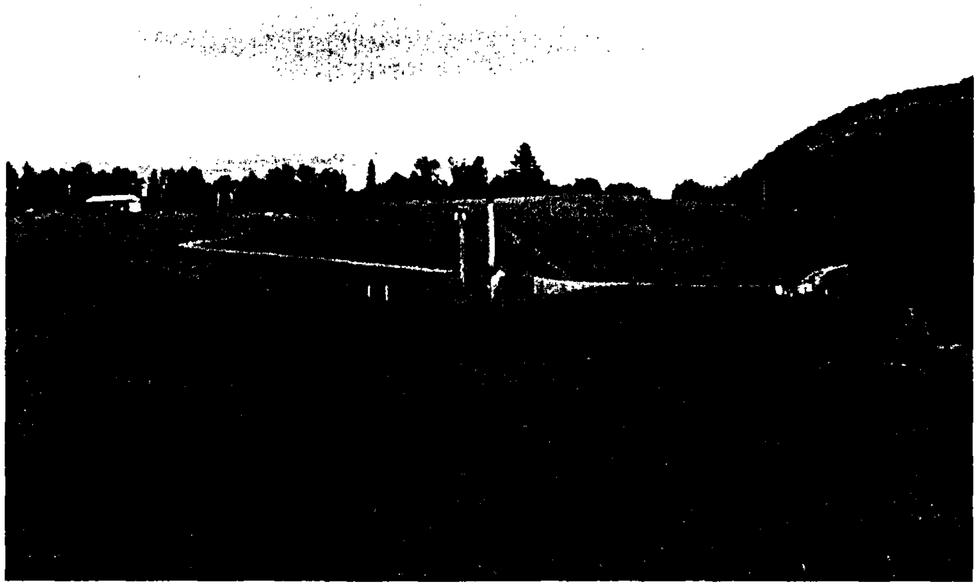


Photo 7. Landfill and flare house, looking north.

Photo 8. Constructed wetland

Photo 9. Looking at new development along Brown Farm Road from BNA well B146B.

Photo 10. Other structures downgradient of BNA area.

ATTACHMENT 5

GROUNDWATER RECLASSIFICATION MEMORANDUM

State of Vermont

Department of Fish and Wildlife
Department of Forests, Parks and Recreation
Department of Environmental Conservation
State Geologist
RELAY SERVICE FOR THE HEARING IMPAIRED
1-800-253-0191 TDD>Voice
1-800-253-0195 Voice>TDD

AGENCY OF NATURAL RESOURCES
Department of Environmental Conservation
WATER SUPPLY DIVISION
103 South Main Street
Old Pantry Building
Waterbury, VT 05671-0403

TEL 802-241-3400
TOLL Free 800 823-6500
FAX 802-241-3284

November 24, 2003

Re: Groundwater Reclassification of the Parker Landfill Site in Lyndon, Vermont

Dear Interested Parties:

The groundwater at the Parker Landfill Site in Lyndon, Vermont has been reclassified by the Agency of Natural Resources from Class III to Class IV. According to Vermont Statute (10 VSA §1394), Class IV groundwater is defined as "Not suitable as a source of potable water but suitable for some agricultural, industrial and commercial use." The Secretary of the Agency of Natural Resources, Elizabeth McLain, signed the Findings of Fact and Reclassification Order on November 6, 2003.

Please see the enclosed Findings of Fact and Reclassification Order for details on the site and issues associated with this decision. Prior to reclassifying the groundwater, the Agency of Natural Resources held a public meeting on the proposed reclassification. A response to comments received at the public meeting is also enclosed. Please note that the boundary of the Class IV area was modified from the original proposal to accommodate concerns expressed at the public meeting.

Any questions regarding the Groundwater Reclassification at the Parker Landfill or groundwater reclassification in general can be directed to me at (802) 241-1412 or toll-free in Vermont at (800) 823-6500. If you have more specific questions on the status of the site, please contact John Schmeltzer of the Waste Management Division at (802) 241-3886.

Sincerely,
Tina Hubbard

Tina Hubbard
Drinking Water Source Protection Specialist

c: Groundwater Coordinating Committee

Findings of Fact & Reclassification Order

Proposed Groundwater Reclassification at the Parker Landfill
Lyndon, Vermont

August 21, 2003

Prepared by:

The Vermont Agency of Natural Resources
and the
Vermont Groundwater Coordinating Committee

Findings of Fact & Reclassification Order
Parker Landfill, Lyndon, Vermont

INTRODUCTION

This document represents the Vermont Agency of Natural Resources' findings and determination to reclassify groundwater from Class III to Class IV at the Parker Landfill, located in Lyndon, Vermont (see map, Attachment A). The 250-acre reclassification area is shown in map view in Attachment B. The findings are based on the considerations outlined in Section 12-403 of the Vermont Groundwater Protection Rule and Strategy, effective January 20, 2000. A copy of the rule is available online at www.vermontdrinkingwater.org or by contacting the Department of Environmental Conservation, Water Supply Division, 103 South Main Street, Waterbury, Vermont 05671-0403 or at (802) 241-3400.

Copies of the petition to reclassify and other supporting documents are available at the Waterbury Office of the Department of Environmental Conservation, Waste Management Division. Much of the information contained here was obtained from the petition to reclassify groundwater, prepared by URS Corporation (March 25, 2002).

BACKGROUND

The Parker Landfill is located on approximately 25 acres situated on the east side of Lily Pond Road in the southeast portion of the Town of Lyndon, Caledonia County, Vermont in vegetated, hilly terrain. Residences border the north and northwest portions of the property. The land slopes westward toward the Passumpsic River. Portions of the Parker Property are currently used by the owner as a storage and maintenance garage for heavy equipment. Part of the property is also planted in hay.

The Parker Landfill was approved as a disposal facility for solid waste in 1971. Ray O. Parker & Sons, Inc. began operating the facility in 1972. Prior to 1972, the disposal area was used as a sand pit and a town disposal area. The industrial wastes disposed at the site included trichoroethylene, sodium hydroxide, 1,1,1- trichloroethane, acetone, lacquer and stain sludge, paint sludge, tetrachloroethane, barium chloride, chromium, nickel plating rinse waters, polyester resin, mercury, electroplating sludge and water soluble coolants. Approximately 1,330,300 gallons of liquid industrial wastes and 688,900 kilograms of liquid, semi-solid, and solid industrial wastes were disposed of at the site between 1972 and 1983. [Source: EPA Record of Decision, 1995]

In February 1990, Parker Landfill was placed on the National Priorities List. In 1999, EPA signed a Unilateral Administrative Order (UAO) with a potentially responsible party, Vermont American Corporation, requiring groundwater clean-up. Under a Consent Decree with other potentially responsible parties, the waste was covered with a multi-layered cap. The cap was completed in the summer of 2001.

The overburden at the site consists of glacio-fluvial and glacio-lacustrine materials. The waste units are situated on top of a thin sandy unit that has a perched water table. Directly beneath the waste units, the thin sandy zone is underlain by a much thicker silty layer that appears to have acted as a barrier to downward contaminant migration. Downgradient from the landfill, near the Passumpsic River, the silty layer pinches out and a thick, transmissive, sandy formation comprises the overburden. Bedrock in the area is metamorphic, and includes the Waits River and Gile Mountain formations.

Surface water runoff from the site generally flows west toward the Passumpsic River. An unnamed stream flows in a southwesterly direction along the east side of the landfill before joining two other unnamed streams south of the landfill. These streams discharge to the Passumpsic River. The groundwater flow system from the landfill also converges on the Passumpsic River. Upward hydraulic gradients from nested wells near the river indicate that the river is a groundwater discharge location.

During a site inspection in 1984, the State detected contaminants in a stream bordering the landfill, in groundwater at the landfill, and in four private wells located less than a mile from the landfill. Subsequent investigations have shown that soil, soil gas, surface water and groundwater at the site are contaminated with a wide range of chemicals. As part of groundwater investigations, about 120 monitoring wells have been drilled and tested. The main contaminants of concern in the groundwater are trichloroethylene (TCE) and its daughter products.

Concentrations greater than 10,000 ug/L of TCE have been seen in shallow wells near the waste units, suggesting that TCE has likely reached the subsurface in non-aqueous form. Near the waste units, the highest contaminant concentrations are found in the perched water above the silt layer. Further down gradient, near the Passumpsic River, contamination is minimal in the shallow sandy overburden, but wells screened in sand at the top of the bedrock and in upper portions of the bedrock itself show elevated TCE concentrations. Samples from one top-of-rock well (B120C) near the river have contained nearly 5,000 ug/L of TCE. The presence of TCE in this well cannot be explained entirely by the prevailing groundwater flow pattern, suggesting dense-nonaqueous-phase liquids may be present in the subsurface.

The reclassification area encompasses 250 acres. It includes a zone where 95% confidence-level statistics indicate that groundwater is contaminated above the Vermont Groundwater Enforcement Standards (VGES), and a 200-foot buffer around the upgradient and crossgradient boundaries of the contamination zone. The downgradient boundary of the reclassification area is the Passumpsic River.

The UAO between Vermont American and EPA requires groundwater extraction and treatment as the groundwater clean-up technology, but site investigators are now looking at other treatment options. Long-term monitoring of groundwater and institutional controls to prevent inappropriate uses of contaminated land and water at the site are also required by the UAO. More than forty wells are currently included in the long-term monitoring program.

All homes and businesses within the reclassification area have been connected to the municipal water supply. Under the institutional control plan for the site, all private wells identified within the reclassification area have been either converted to monitoring wells or abandoned in accordance with state regulations.

<u>AGENCY REVIEW</u>

Below is the Agency of Natural Resources' review of the Parker Landfill site with respect to the Groundwater Protection Rule and Strategy Section 12-403 Class I, II, III and IV Groundwater Reclassification Process. This information is based on the following document:

> *Petition for Groundwater Reclassification, Parker Landfill, Inc., Lyndon, Vermont.* URS Corporation, March 25, 2002.

In determining whether or not to reclassify groundwater as Class I, II, III, or IV, the Secretary shall consider the following:

(1) <u>The use or potential future use of the groundwater as a public water supply source</u>

Municipal water is available to the properties within the Class IV Groundwater Area and easements are or will be in place to restrict groundwater use. However, the overburden aquifer is transmissive and could represent an enticing water supply opportunity to individuals unaware of contaminant risks. A Class IV designation for the groundwater in the area would provide another institutional control to prohibit future public water supply development.

(2) <u>The extent of activity which poses a risk to the groundwater</u>

Disposal of industrial wastes, the high-risk land use which led to the present contamination, was discontinued in 1983. Solid waste disposal was discontinued in 1992. Residual contamination in the subsurface from past disposal practices may be serving as a continuing source of groundwater contamination.

(3) <u>The current water quality of the groundwater</u>

Numerous rounds of groundwater sampling have been performed at the Parker Landfill between October 1984 and October 2000. About 120 wells have been drilled and tested. The contaminant zone boundaries have been defined using a 95% confidence level statistic for monitoring points which exceed the Vermont Groundwater Enforcement Standards (VGES).

Dissolved TCE concentrations in groundwater have been detected at levels as high as 5,000 ug/L in a deep monitoring well near the Passumpsic River (# B120C). TCE concentrations near the center of the contamination zone range up to 10,000 ug/L. Over the approximately 125-acre areal extent of the plume, groundwater quality consistently exceeds the VGES for TCE.

Due to elevated contaminant levels, the groundwater is unsuitable for use as drinking water. The groundwater should not be used for agricultural, industrial, or commercial uses in situations where it may cause health risks.

(4) The availability of groundwater in quantities needed for beneficial use

According to the Vermont Groundwater Protection Rule and Strategy, beneficial use refers to specific groundwater uses deemed appropriate for a designated groundwater class. Class IV groundwater is not considered to be a potable water source but may be suitable for some agricultural, commercial, or industrial uses.

As noted above, the groundwater in the Class IV Groundwater Area has no beneficial uses at present. Although the subsurface water resource is capable of yielding a plentiful supply, the on-site groundwater will be unsuitable for any beneficial use unless it receives treatment or until present levels of contamination are substantially reduced.

Reclassification of the groundwater to Class IV is necessary to protect future users from inappropriate use of the groundwater for potable supplies. Other protections, such as deed restrictions or landowner agreements, will prevent other inappropriate beneficial uses of the on-site groundwater. The Secretary will not issue permits for drinking water supplies within the Class IV boundary.

(5) The consequences of potential groundwater contamination and the availability of alternate sources of water

Use of any onsite water source must be avoided until contaminant concentrations are reduced by the site remediation system to be constructed and by natural attenuation. A Class IV designation will prevent development of any water supply requiring a permit from the Secretary. Municipal water is available as an alternative water source within the Class IV Groundwater Area.

(6) The classification of adjacent surface waters

Groundwater from the site discharges to an unnamed stream and to the Passumpsic River. The State of Vermont has classified these waters as Class B. Class B waters are considered suitable for the following uses: water supply with filtration and disinfection; irrigation and other agricultural uses; swimming, and recreation.

The surface water data indicates that the groundwater contamination is not adversely affecting the water quality of the Passumpsic River. However, TCE has been detected at low concentrations in the samples taken from the unnamed stream near the landfill.

(7) The probability for use as a public water supply source

Although the site could potentially provide high-yield water supplies, it is both unsuitable for use as a potable supply and unlikely to be needed for such use in the future. The town of Lyndon gets its water supply from a sand and gravel aquifer on the opposite end of the town. The municipal water system was expanded this past spring with the addition of one more well at the well field. In the case of an unanticipated need for an additional public water supply source in the area, a Class IV designation will prevent the inappropriate development of a public water supply at the Parker landfill.

(8) Other factors relevant to determining the maximum beneficial use of the groundwater

Under the Unilateral Administrative Order (UAO) between Vermont American Corporation and EPA, the properties in the groundwater reclassification area will be subject to other institutional controls to prevent inappropriate uses of contaminated land and water at the site, including an easement that prohibits groundwater use.

RECLASSIFICATION AREA

The 250-acre reclassification area has been delineated in accordance with the DEC guidance document entitled "Procedure for Class IV Groundwater Reclassification," dated November 12, 2000. Supporting documentation outlining the basis for the delineation is available in the Petition for Groundwater Reclassification, Parker Landfill, Lyndon, Vermont. URS Corporation, March 25, 2002.

The Class IV Groundwater Area is shown on the map, Attachment B, and a legal description of the reclassification area boundary is file at the DEC Water Supply Division Waterbury, VT. Attachment C provides a list of current property owners within the Class IV Groundwater Area boundaries.

MONITORING AND MANAGEMENT REQUIREMENTS

Restrictions on groundwater use and additional monitoring requirements for the Parker Landfill may be applicable under Sections 12-401(7), which states:

> *Any classification or reclassification decision issued by the Secretary may include special conditions for the management of the classified groundwater area which shall apply to activities regulated by the Secretary.*

Long-term monitoring of groundwater at the site is required by the U.S. Environmental Protection Agency. More than forty wells are currently included in the long-term monitoring program. The Class IV boundary delineation shall be evaluated if contaminant levels in the sentinel wells along the eastern and western boundaries of the Class IV Groundwater Area equal or exceed Vermont Preventive Action Levels.

Rationale for Reclassifying Groundwater at the Parker Landfill, Lyndon, Vermont

The following is a listing of reasons for reclassifying the groundwater at the Parker Landfill located in Lyndon, Vermont from Class III to Class IV.

1. The groundwater beneath the site is not used and is not likely to be used as a public water supply source.

2. The groundwater is contaminated by a number of organic contaminants and metals as summarized in the *Petition for Groundwater Reclassification*.

3. The groundwater quality does not meet the Vermont Groundwater Enforcement Standards set forth in the Groundwater Protection Rule and Strategy.

4. The groundwater is degraded to the point that it is not suitable as a source of potable water but may be suitable for some agricultural, industrial, or commercial uses.

5. Local surface waters that receive groundwater discharges are classified by the State of Vermont as Class B.

6. The current activities at the site are intended to prevent the further degradation of groundwater quality.

Findings of Fact

1. Since 1984, environmental investigations at the Parker landfill have identified a zone of groundwater contamination stemming from the disposal of industrial wastes.

2. In 1999, EPA signed a Unilateral Administrative Order (UAO) with Vermont American which outlined the steps by which groundwater contamination originating from the Parker Landfill would be investigated, remediated, and monitored over the long term.

3. Based on information prepared by URS Corporation, the environmental consultant for Vermont American, the DEC Waste Management Division submitted a reclassification petition on March 25, 2002.

4. The Agency of Natural Resources reviewed the application and determined that the groundwater beneath an 250-acre area at the Parker Landfill meets the criteria for reclassification from Class III to Class IV in accordance with the Groundwater Protection Rule & Strategy and 10 V.S.A. Chapter 48.

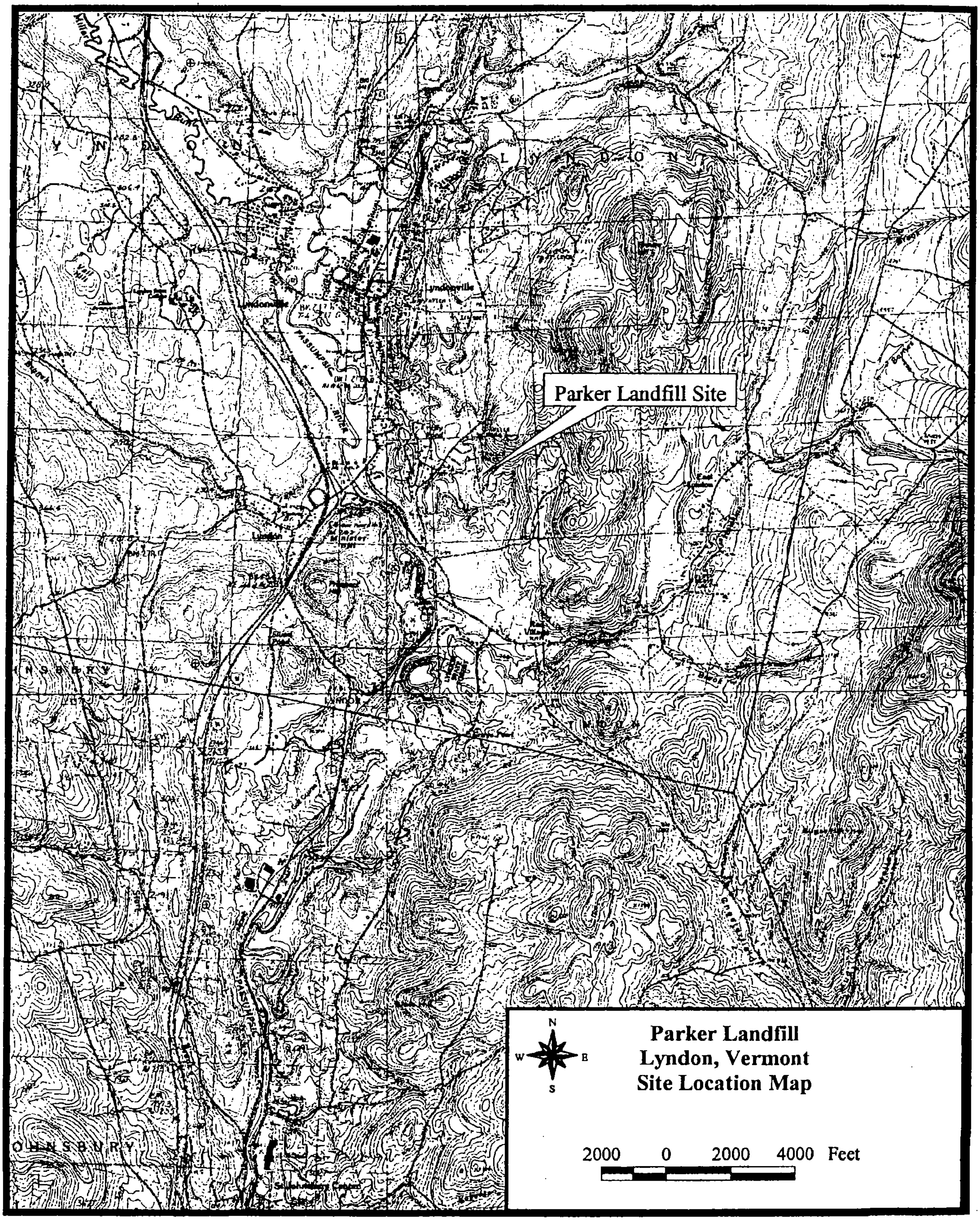
I hereby make the Findings of Fact identified above and reclassify the groundwater to Class IV under the Parker Landfill and adjoining property identified in this document.

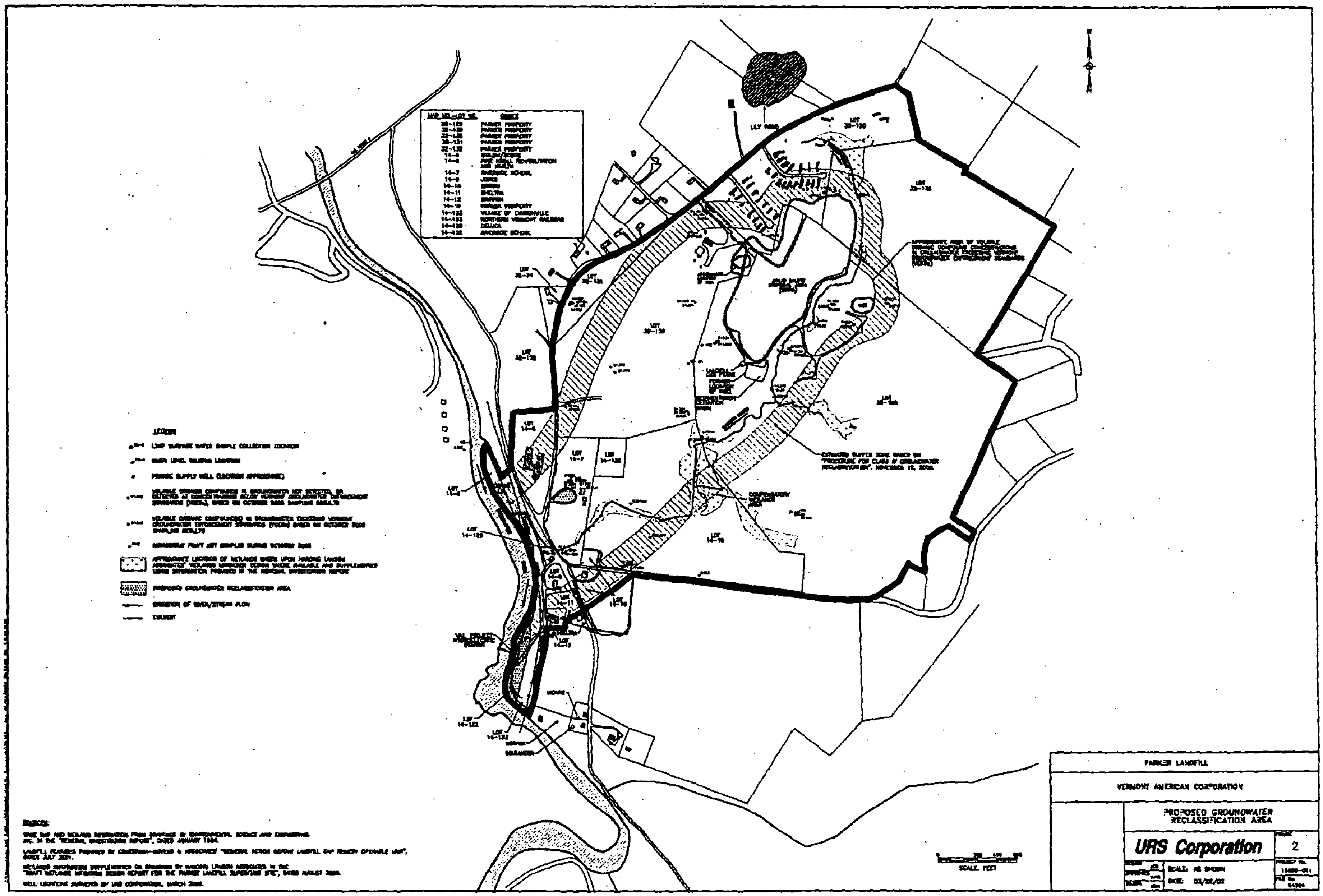
Elizabeth McLain

Elizabeth McLain, Secretary
Agency of Natural Resources

Date 11-6-03

Attachment A





Attachment B

Findings of Fact & Reclassification Order
Parker Landfill, Lyndon, Vermont

Attachment C
List of Property Owners within the Reclassification Area

Map Lot	Owner	Property Mailing Address
32-128	Parker	D&A Enterprises, Inc P.O. Box 25 Lyndonville, VT 05851 Anne H. Parker P.O. Box 25 Lyndonville, VT 05851 Ray O. Parker and Sons, Inc. P.O. Box 25 Lyndonville, VT 05851
32-129	Parker	
32-130	Parker	
32-131	Parker	
32-132	Parker	
14-19	Parker	
14-129	Mark DeLuca	10 Light Plant Drive Lyndonville, VT 05851
14-5	Rolf Gidlow/Sylvia Dodge	580 Red Village Road Lyndonville, VT 05851
14-6	Pine Knoll Rehabilitation & Health	601 Red Village Road Lyndonville, VT 05851
14-7	Riverside School	30 Lily Pond Road Lyndonville, VT 05851
14-132	Riverside School	30 Lily Pond Road Lyndonville, VT 05851
14-9	Joyce Jones	49 Light Plant Drive Lyndonville, VT 05851
14-10	Denise Brown	737 Red Village Road Lyndonville, VT 05851
14-11	Blanche Sheltra	794 Red Village Road Lyndonville, VT 05851
14-12	Erven Griffith	P.O. Box 232 Lyndonville, VT 05851
14-122	Village of Lyndonville	P.O. Box 167 Lyndonville, VT 05851
14-123	Northern Vermont Railroad	P.O Box 39 Newport, VT 05855

Parker Landfill Class IV Reclassification
Response to Questions and Comments from Interested Parties
August 21, 2003

What is the Groundwater Coordinating Committee and who are its members?

The Groundwater Coordinating Committee is a multi-agency group established by the Secretary of the Agency of Natural Resources (ANR) under the authority of 10 VSA Chapter 48 §1392. The official members of the Committee include representatives from the following organizations:

- *Agency of Agriculture, Food, and Markets*
- *Department of Forests, Parks, and Recreation*
- *Department of Health*
- *Department of Environmental Conservation*
  - *Water Supply Division*
  - *Wastewater Management Division*
  - *Waste Management Division*
  - *Water Quality Division*
  - *Geology Division*

Currently, the Committee also includes a representative from the Agency of Transportation, an EPA representative, an industry representative from a hydrogeological consulting firm, and 47 other interested parties from both government and the private sector. The group advises the ANR Secretary on matters concerning groundwater, including groundwater classification.

What is the purpose of the 200 ft buffer around the contamination zone at the Parker Landfill site?

The zone of contamination is defined by assessing the existing groundwater quality data to determine where groundwater quality exceeds Vermont Groundwater Enforcement Standards (VGES) at a 95% statistical confidence level. Since monitoring wells can be sparse at many sites, hydrogeologists must use their best judgment to interpolate between monitoring points in order to draw a continuous line. There is uncertainty associated with this process. The buffer provides some leeway for error.

The 200 ft buffer also provides protection from inadvertent withdrawal of contaminated water into a residential well placed outside the contaminant zone boundary. In creating the Class IV boundary, petitioners are required to calculate the radius of influence for a hypothetical 1 gallon-per minute (gpm) well – a yield that could serve a large single family home. If the calculated radius of influence is greater than 200 feet, then the buffer is enlarged to equal that radius. If smaller, the 200 ft buffer is maintained.

For the Parker Landfill reclassification, the petitioner took a more conservative approach and calculated the radius of influence for a 3 gpm well (large enough to serve a small subdivision). In this geological setting, even the radius for the 3 gpm well was calculated to be less than 200 feet, so the buffer width was set at 200 ft.

The 200 ft minimum buffer width is consistent with general regulatory setback requirements for residential water supply wells. According to the Water Supply Rule, no such well may be constructed within 200 feet of any hazardous waste site. Public and small-scale water system wells are subject to more stringent installation criteria.

Why does the reclassification boundary follow property boundaries and not the outer margin of the 200 ft buffer around the contamination zone?

Once a zone of contamination and its buffer are determined, the state's procedure for reclassification allows for adjustments to the boundary to improve future administration of the Class IV area. In order to protect public health, is especially important to make sure the Class IV boundary is recognizable on the ground and not just on maps. In most cases, the boundary is adjusted to follow property lines or transportation corridors. In the Parker Landfill case, the Class IV boundaries were adjusted to match the outer boundaries of the properties in which easements prohibiting groundwater use are being obtained. The attainment of these easements is required as part of the institutional control plan. As part of their obligations under a Unilateral Administrative Order (UAO) with the USEPA, Vermont American must obtain these easements.

The reclassification reduces the value of property in that people are less likely to want to buy land that they can't install a well on. Why shouldn't I be allowed to install a well on the portion of my property outside the buffer zone?

The Groundwater Coordinating Committee prefers to follow property boundaries or transportation corridors in outlining a Class IV area to make the boundary easier to administrate. However, the Committee is willing to reconsider this practice on a case-by-case basis. In this case, the Committee has elected to alter the proposed Class IV boundary to bisect, rather than encompass, Lot 14-10 in response to a request from the property owner, Denise Brown.

What happens to the reclassification area if the contamination is cleaned up?

If site data provide conclusive evidence that groundwater within all or part of the Class IV Area has been rendered potable, all or part of the area may be reclassified as Class III. At present, there are no cases in the State of Vermont where a Class IV designation has been altered to reflect improvements in groundwater quality.

ATTACHMENT 6

UPDATED TOXICITY DATA AND RISK CALCULATIONS

Table 1
Current Toxicity Criteria for Carcinogens

Constituent	Wt of Evidence Classification	Old Oral Slope Factor (mg/kg-d)-1	New Oral Slope Factor (mg/kg-d)-1
Acetone	D (a)		
Benzene	A (a)	2.9E-02 (a)	5 5E-02 (b)
Butanone, 2-	D (a)		
Chloroform	B2 (a)	6 1E-03 (a)	3 1E-02 (g)
Chloroethane	B2 [c]	2.9E-02 [c]	None (b)
Dichlorodifluoromethane	- - (a)		
Dichloroethane, 1,1-	C (a)		5.7E-03 (g)
Dichloroethene, 1,1-	C (a)	6E-01 (a)	None (b)
Dichloroethene, 1,2- (total)	- -		
Dichloropropane, 1,2-	B2 (e)	6.8E-02 (e)	3.6E-02 (g)
Dioxane, 1, 4-	B2 (b)		1.1E-02 (b)
Ethyl Benzene	D (a)		1.1E-02 (g)
Methylene Chloride	B2 (a)	7 05E-03 (a)	Same (b)
Methyl-2-Pentanone, 4- (MIBK)	--		
Tetrachloroethene	B2-C [c]	5 2E-02 [c]	5.4E-01 (g)
Toluene	D (a)		
Trichloroethane, 1,1,1-	D (a)		
Trichloroethene	B2-C [c]	1.1E-02 [c]	1.3E-02 (g)
Vinyl Chloride	A (a)	1.9E+00 [c]	7.2E-1 adult (b)
Vinyl Chloride (cont'd)			1.4E+00 from birth (b)
Xylenes, Total	D (a)		
Bis (2-ethylhexyl) Phthalate	B2 (a)	1 4E-02 (a)	Same (b)
Dibenzofuran	D (a)		
Diethyl phthalate	D (a)		
Di-n-butylphthalate	D (a)		
Fluoranthene	D (a)		
Fluorene	D (a)		
Methylnaphthalene, 2-	D (a)		
Methylphenol, 4- (p-cresol)	C (a)		
Naphthalene	C (a)		
Phenanthrene	D (a)		
Pyrene	D (a)		
Aluminum	D [c]		
Antimony	-- (a)		
Arsenic	A (a)	1.75E+00 (a)	1.5E+00 (b)
Barium	D (a)		
Beryllium	B1 (a)	4.3E+00 (a)	None (b)
Cadmium	B1 (a)		
Chromium (total)	D oral, A inh.		
Cobalt	--		
Copper	D (a)		
Cyanide	D (a)		
Iron	--		
Lead	B2 (a)		
Manganese	D (a)		
Nickel	A (a)		
Selenium	D (a)		
Vanadium	D (d)		
Zinc	D (a)		

(a) IRIS, Integrated Risk Information System, 1993
(b) IRIS, Integrated Risk Information System, 2009 (http://www.epa.gov/iris/)
[c] Interim value from ECAO, 1992
(d) PPRTV value from STSC, 2009
(e) Health Effects Assessment Summary Tables (HEAST), FY 1992
(f) Health Effects Assessment Summary Tables (HEAST), FY 1997
(g) California OEHHA value, 2009

Table 2
Current Toxicity Criteria for Non- Carcinogens

Constituent	Old Oral Rfd mg/kg-d	New Oral RfD mg/kg-d
Acetone	1E-01 (a)	9E-01 (b)
Benzene		4E-03 (b)
Butanone, 2-	5E-02 (a)	6E-01 (b)
Chloroform	1E-02 (a)	Same (b)
Chloroethane	4E-01 [c]	None (b)
Dichlorodifluoromethane	2E-01 (a)	Same (b)
Dichloroethane, 1,1-	1E-01 (e)	2E-01 (d)
Dichloroethene, 1,1-	9E-03 (a)	5E-02 (b)
Dichloroethene, 1,2- (total)	9E-03 (e)	Same (f)
Dichloropropane, 1,2-		9E-02 (k)
Dioxane, 1, 4-		1E-01 (k)
Ethyl Benzene	1E-01 (a)	Same (b)
Methylene Chloride	6E-02 (a)	Same (b)
Methyl-2-Pentanone, 4- (MIBK)	5E-02 (a)	8E-02 (f)
Tetrachloroethene	1E-02 (a)	Same (b)
Toluene	2E-01 (a)	8E-02 (b)
Trichloroethane, 1,1,1-	9E-02 (e)	2E+00 (b)
Trichloroethene	6E-03 [c]	None (b)
Vinyl Chloride	None	3E-03 (b)
Xylenes, Total	2E+00 (a)	2E-01 (b)
Bis (2-ethylhexyl) Phthalate	2E-02 (a)	Same (b)
Dibenzofuran	4E-03 [c]	None (b)
Diethyl phthalate	8E-01 (a)	Same (b)
Di-n-butylphthalate	1E-01 (a)	Same (b)
Fluoranthene	4E-02 (e)	4E-02 (b)
Fluorene	4E-02 (e)	4E-02 (b)
Methylnaphthalene, 2-	None	4E-03 (b)
Methylphenol, 4- (p-cresol)	5E-03 (e)	Same (f)
Naphthalene	4E-02 (e)	2E-02 (b)
Phenanthrene	4E-02 (e,g)	2E-02 (b,g)
Pyrene	3E-02 (a)	Same (b)
Aluminum	1E+00 [c]	Same (d)
Antimony	4E-04 (a)	Same (b)
Arsenic	3E-04 (a)	Same (b)
Barium	7E-02 (a)	2E-01 (b)
Beryllium	5E-03 (a)	2E-03 (b)
Cadmium	5E-04 (a,h)	Same (b,h)
Chromium (total)	5E-03 (a,i)	3E-03 (b,i)
Cobalt		3E-04 (d)
Copper		4E-02 (f)
Cyanide	2E-02 (a)	Same (b)
Iron	None	7E-01 (d)
Lead		
Manganese	5E-03 (a)	2.4E-02 (j)
Nickel	2E-02 (a,j)	Same (b,j)
Selenium	5E-03 (a)	Same (b)
Vanadium	7E-03 (e,k)	5E-03 (b)
Zinc	2E-01 (a)	3E-01 (b)

(a) IRIS, Integrated Risk Information System, 1993
(b) IRIS, Integrated Risk Information System, 2009 (http://www.
[c] Interim value from ECAO, 1992
(d) PPRTV value from STSC, 2009
(e) Health Effects Assessment Summary Tables (HEAST), FY 1
(f) Health Effects Assessment Summary Tables (HEAST), FY 1!
(g) Value is cross-assigned from Naphthalene
(h) Cadmium RfD is for water, 1E-03 mg/kg-d is the RfD for foo
(i) Value is for hexavalent chromium
(j) Value is for nickel, soluble salts
(k) ATSDR, 2009